



EAGLE SERVICE MANUAL Eagle I-IV, File 10

Copyright 1983 by EAGLE Computer, Incorporated of Los Gatos, California. The contents of this publication may not be reproduced in any form, by any means, in part or in whole, without the prior written permission of EAGLE Computer, Inc., 983 University Avenue, Los Gatos, California 95030.

EAGLE Computer makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties or merchantability or fitness for any particular purpose. Further, EAGLE Computer reserves the right to revise this publication and to make changes from time to time without obligation of EAGLE Computer to notify any person of such revision or changes.

EagleCalc is a registered trademark of Eagle Computer, Inc., of Los Gatos, CA.

EagleWriter is a registered trademark of Eagle Computer, Inc., of Los Gatos, CA.

MS-DOS is a registered trademark of Microsoft, Inc., of Bellvue, WA.

CP/M-86 and MP/M-86 are registered trademarks of Digital Research, Inc., of Pacific Grove, CA.

Released by EAGLE Computer, Inc. January 1983.

P/N: 93-1234-A00

TABLE OF CONTENTS

	Page
SECTION 1: GENERAL INFORMATION	
INTRODUCTION	1
EAGLE SYSTEM MODULE DESCRIPTIONS	2
CRT MODULE	2
DISK DRIVE MODULE	2
KEYBOARD MODULE	2
MAIN BOARD MODULE	2
POWER SUPPLY MODULE	2
WINCHESTER CONTROLLER MODULE	3
SASI INTERFACE MODULE	3
EAGLE SYSTEM TECHNICAL FEATURES	4
WARRANTY POLICY	6
HARDWARE	6
SOFTWARE	6
EFFECTIVE PERIOD OF WARRANTY	6
PROOF OF WARRANTY	6
REPAIRED OR REPLACEMENT PRODUCT (OFF OF WARRANTY)	7
WARRANTY LIMITS	7
WARRANTY CREDITS	7
WARRANTY STATEMENT	8
SERVICE POLICY AND PROCEDURE	9
RETURN PROCEDURE	9
COMPLAINTS	10
SECTION 2: INSTALLATION AND CHECKOUT	
PRELIMINARY INSPECTION	11
UNPACKING	12
EAGLE I - IV	12
FILE 10	13
INSTALLATION	14
SITE REQUIREMENTS	14
EAGLE II - IV INSTALLATION	14
FILE 10 INSTALLATION	14
INITIAL CHECKOUT	16
EAGLE II - III WITHOUT FILE 10	16
EAGLE IV, AND EAGLE II - III WITH FILE 10	17
PRINTER INSTALLATION	18
SERIAL INPUT/OUTPUT PORTS	18
PARALLEL OUTPUT PORT	18
SETTING THE SYSTEM PRINTER PARAMETERS	18
SETTING THE PARAMETERS FOR A MODEM	20
SETTING THE PARAMETERS WITHOUT A PERIPHERAL DEVICE	20

TABLE OF CONTENTS (CONT'D)

	Page
SECTION 3: SYSTEM OVERVIEW	
INTRODUCTION	21
MAIN BOARD MODULE	23
CENTRAL PROCESSING UNIT Z-80A	23
DIRECT MEMORY ACCESS CONTROLLER	23
PARALLEL INPUT/OUTPUT CONTROLLER	26
DUAL ASYNCHRONOUS RECEIVE TRANSMITTER	26
FLOPPY DISK CONTROLLER	30
KEYBOARD ENCODER	30
BOOT PROM	34
CRT 8002 & 5037	34
CRT MODULE	35
DISK DRIVE MODULE	35
FLOPPY DISK DRIVES	35
WINCHESTER DISK DRIVES	35
KEYBOARD MODULE	37
POWER SUPPLY MODULE	37
WINCHESTER CONTROLLER MODULE	38
SASI INTERFACE MODULE	38
SECTION 4: HARDWARE MAINTENANCE	
INTRODUCTION	39
MAINTENANCE PRECAUTIONS	39
SPECIAL HANDLING INSTRUCTIONS	40
CRT MODULE	40
EAGLE IV & FILE 10	40
PREVENTATIVE MAINTENANCE	41
SYSTEM DIAGNOSTICS	43
"T" TEST DIAGNOSTICS	43
DISK DRIVE DIAGNOSTICS	45
Disk Diagnostic	45
Hard Disk Test & Initialization	46
FAULT ISOLATION	50
POWER SUPPLY MODULE	50
Power Supply Output Check Procedure	50
MAIN BOARD MODULE	52
DISK DRIVE MODULE	53
WINCHESTER CONTROLLER MODULE	53
HARD DISK DRIVE MODULES	54
KEYBOARD MODULE	54
CRT MODULE	55
FAN MODULE	55

TABLE OF CONTENTS (CONT'D)

	Page
SECTION 4: HARDWARE MAINTENANCE (CONT'D)	
REMOVAL AND INSTALLATION PROCEDURES	56
MAIN BOARD MODULE REMOVAL	57
MAIN BOARD MODULE INSTALLATION	57
POWER SUPPLY MODULE REMOVAL	59
POWER SUPPLY MODULE INSTALLATION	59
DISK DRIVE MODULE REMOVAL	60
DRIVE CONFIGURATION	62
DISK DRIVE MODULE INSTALLATION	64
WINCHESTER CONTROLLER MODULE REMOVAL	66
WINCHESTER CONTROLLER MODULE INSTALLATION	67
HARD DISK POWER SUPPLY MODULE REMOVAL	68
HARD DISK POWER SUPPLY MODULE INSTALLATION	68
KEYBOARD MODULE REMOVAL	69
KEYBOARD MODULE INSTALLATION	69
FAN MODULE REMOVAL	70
FAN MODULE INSTALLATION	70
CRT MODULE REMOVAL	72
CRT MODULE INSTALLATION	73
CRT ADJUSTMENT PROCEDURE	74
SECTION 5: SOFTWARE MAINTENANCE	
INTRODUCTION	79
TRANSFERRING FILES	80
TRANSFER EAGLE SOFTWARE	80
SINGLE FILE TRANSFER	82
FAULT ISOLATION	83
MAIN MENU	83
OPERATING SYSTEM	84
PROGRAMS AND FILES	84
PERSISTENT HARD DISK PROBLEMS	85
SOFTWARE INSTALLATION	86
MAIN MENU REGENERATION	86
SYSTEM REGENERATION	88
RESTORING FILES FROM BACKUP	89
RESTORING THE ENTIRE HARD DISK	90

TABLE OF CONTENTS (CONT'D)

	Page
SECTION 6: PARTS	
INTRODUCTION	95
HARDWARE ASSEMBLIES	96
HARDWARE SUB-ASSEMBLIES	96
CABLES	97
DISKETTES AND DIAGNOSTIC PROGRAMS	97
TOUCH UP PAINT	97
SERVICE KITS	98
TOOLS	100
SECTION 7: APPENDICES	
APPENDIX A: COMMUNICATION PORTS	103
APPENDIX B: TECHNICAL SPECIFICATION	111
APPENDIX C: BIOS DOCUMENTATION	115
APPENDIX D: EPROM ERROR MESSAGES	135
APPENDIX E: SCHEMATICS	137
INDEX	139

FIGURES

		Page
Figure 1	Eagle System Block Diagram	22
Figure 2	Eagle System Buses	24
Figure 3	Main Board Component Layout	25
Figure 4	Parallel B Printer Port	27
Figure 5	Parallel A Hard Disk Port	28
Figure 6	Z-80A Dart Schematic Breakout	29
Figure 7	MPD 765 Schematic Breakout	32
Figure 8	PRO 3600 Schematic Breakout	33
Figure 9	Floppy Disk Functional Diagram	36
Figure 10	Eagle Computer Hard Disk Utilities Menu	46
Figure 11	Hard Disk Test Menu	47
Figure 12	CRT Adjustment Points	78
Figure 13	Memory Map	118
Figure 14	I/O Port Map	120
Figure 15	Keyboard	121
Figure 16	Video Display Register	122
Figure 17	Parallel Port	123
Figure 18	Control Words	124
Figure 19	Read and Write Registers	127

TABLES

		Page
Table 1	Eagle System Technical Features	4
Table 2	Floppy Disk Controller Signals	31
Table 3	Power Supply Voltages	37
Table 4	System "T" Tests	44
Table 5	Hard Disk Functions	48
Table 6	System Power Requirements	52
Table 7	Value Assignments	116
Table 8	Logical Devices	116
Table 9	Write Register Functions	128
Table 10	Read Register Functions	129
Table 11	Video Control Codes	133
Table 12	Escape Sequences	133

INTRODUCTION

The Eagle I-IV Computers are stand-alone business computer systems. The entire system, including keyboard, CRT, CPU and disk drives is housed in a single desk top cabinet. All Eagle systems use the CP/M operating system to handle a wide variety of applications programs.

Each system supports the latest in data storage devices, providing a total storage capacity of between 360 thousand and approximately 16 million characters, depending on the system model. The File 10 hard disk storage unit increases the total storage capacity of any Eagle by an additional 10 million characters. Eagle computer systems are modular in design to increase reliability and make servicing easier. The Eagle computers and File 10 unit consist of the following modules:

Eagle I-III

CRT
Disk Drive
Keyboard
Main Board
Power Supply
Fan

Eagle IV

CRT
Disk Drive
Keyboard
Main Board
Power Supply
Fan
Winchester Disk Drive
Winchester Controller
SASI Interface
Power Supply

File 10

Winchester Disk Drive
Winchester Controller
SASI Interface
Power Supply
Fan

1: GENERAL INFORMATION

EAGLE SYSTEM MODULE DESCRIPTIONS

CRT MODULE

Located in the monitor/drive enclosure on top of the base assembly. The CRT (cathode ray tube) module consists of a Motorola monitor assembly containing a 12" CRT and internal power supply. The CRT monitor has a green phosphor display and will display 24 lines of text with 80 characters in each line in fixed pitch.

DISK DRIVE MODULE

Located in the monitor/drive enclosure on top of the base assembly. The disk drive module contains either one or two single sided floppy disk drives in Eagle I and II, the Eagle III contains two double sided drives. The Eagle IV contains a Winchester hard disk drive and a double sided floppy disk drive.

KEYBOARD MODULE

Located in the base assembly. The keyboard layout resembles an IBM selectric keyboard. A ten-key pad and special function keys for word processing applications are included on every keyboard.

MAIN BOARD MODULE

Located in the base assembly. It is based on the Z-80A microprocessor, and has 64K RAM (Random Access Memory). A single circuit board contains all the support circuitry for the floppy disk drives, the CRT, the keyboard, two parallel ports, and two user definable serial ports.

POWER SUPPLY MODULE

Located in the base assembly. It is a switching-type supply providing all the necessary DC voltages (+5 volts, +12 volts, and -12 volts) for the main board module and a +5 volts and +12 volt supply to the floppy disk drives. The power supply is designed to provide stable operating voltages to the system, from an AC source as low as 95 VAC. It can operate on either 110 VAC, 60 Hz; or 220 VAC, 50 Hz.

EAGLE SYSTEM MODULE DESCRIPTIONS (CONT'D)

**POWER SUPPLY MODULE
(CONT'D)**

In Eagle IV systems, an additional power supply module is located in the top left rear corner of the cabinet, which supplies power (+5 volts only) to the hard disk drive.

**WINCHESTER CONTROLLER
MODULE**

Located under the main board in the base assembly in an Eagle IV. In a File 10, it is located next to the disk drive. The module consists of one circuit board, the Xebec Winchester controller board.

The controller is connected to the main board via two ribbon cables and a Shugart Associates System Interface (SASI) board. The controller is connected to the disk drive via two additional ribbon cables.

SASI INTERFACE MODULE

Consists of one circuit board located in the base assembly next to the Winchester controller board. This interface board provides additional buffering to the I/O lines between the main board and the Winchester controller board.

1: GENERAL INFORMATION

TABLE 1: EAGLE SYSTEM TECHNICAL FEATURES

FEATURE	DESCRIPTION
Operating System	CP/M
Video Display	12-inch screen (measured diagonally). P31 Phosphor (green characters against dark background). External brightness control. Anti-glare screen.
Display size:	8.5" x 6.0", 24 lines, 80 characters/line.
Keyboard	IBM Selectric-style typewriter keyboard layout Multifunction keys Numeric keypad Secretarial SHIFT keys Alphanumeric upper case LOCK key 2 User-definable function keys 2 Key rollover
Central Processing Unit	
Processor	Z-80A, 8 bit microprocessor operating @ 4 MHz
Memory	64K Dynamic RAM
Interface Capabilities	Centronics compatible parallel printer port Hard disk parallel port Two user-definable RS-232 serial ports

(CONT'D)

TABLE 1: EAGLE SYSTEM TECHNICAL FEATURES (CONT'D)

FEATURE	DESCRIPTION
Storage Devices	
Floppy disk drives:	Single or double sided Quad-density recording format Removable media
Winchester disk drives	Non-removable media No preventative maintenance Mini-floppy "foot print"
Data Storage Capacity:	
Eagle I	One single sided floppy disk drive, total formatted storage capacity: 390,000 characters
Eagle II	Two single sided floppy disk drives, total formatted storage capacity: 780,000 characters
Eagle III	Two double sided floppy disk drives, total formatted storage capacity: 1.6 million characters
Eagle IV	One double sided floppy disk drive, one Winchester hard disk drive, total formatted storage capacity: 10 million characters
FILE 10	One Winchester hard disk drive, total formatted storage capacity: 10 million characters.

1: GENERAL INFORMATION

WARRANTY POLICY

HARDWARE

Eagle Computer, Inc., hereinafter referred to as Eagle, for the effective period of the warranty set out below, warrants that its standard products sold hereunder will be free from defects in workmanship or material under normal use and service. Eagle's obligation under this warranty shall not arise until the end user notifies an authorized Eagle Dealer repair facility concerning the defective product. Eagle's responsibilities under this warranty are at its option to replace, or repair, without charge, any defective product or defective component part of such product.

SOFTWARE

Eagle warrants that software supplied hereunder shall conform to the then current published documentation applicable to such programs. Eagle, for the effective period of this warranty, will upon written notice from the dealer documenting the symptom of the defect, attempt to resolve program bugs and/or faults. This service shall be without extra charge to the dealer.

EFFECTIVE PERIOD OF WARRANTY

Type Coverage	From Date Purchased by End User
Parts and Labor	90 Days
Parts Only	1 Year

PROOF OF WARRANTY

The burden of proof of warranty rests solely with the end user. Suitable proof of purchase (i.e. a copy of the original invoice, Bill of Sale, or other form of acceptable receipt) must accompany all products being returned for warranty repair.

WARRANTY POLICY (CONT'D)

REPAIRED OR REPLACEMENT PRODUCT (OUT OF WARRANTY)

Eagle, for a period of 30 days, warrants that its standard products repaired or replaced hereunder shall be free from defects in workmanship or material under normal use and service. Eagle's obligation under this warranty shall not arise until the end user notifies an authorized dealer repair facility. The responsibilities of Eagle under this warranty are at its option to repair, or replace, without charge, any defective component part of such products.

WARRANTY LIMITS

1. Eagle's obligation under this warranty is limited to the original purchaser of the product.
2. Repairs or replacements under this warranty shall not extend the period of the original product warranty.
3. This warranty does not extend to and shall not apply to:
 - a. Products which have been repaired or altered by other than Eagle personnel or authorized dealer service centers, unless the end user has properly altered or repaired the products in accordance with procedures previously approved, in writing, by Eagle.
 - b. Products which have been subject to misuse, neglect, accident or improper installation.
 - c. Products not manufactured by Eagle.

WARRANTY CREDITS

An Authorized dealer will receive a \$50.00 warranty credit for each repair performed on an end-user owned product which is covered under the first 90 days of this warranty policy. To receive credit, the Authorized dealer must submit a "Request For Warranty Credit" form to Eagle's service department. The address is:

Eagle Computer, Inc.
1070 Florence Way
Campbell, California 95008
Attn: Service Department

1: GENERAL INFORMATION

WARRANTY POLICY (CONT'D)

WARRANTY STATEMENT

The foregoing warranty and remedies are exclusive and are made expressly in lieu of all other warranties expressed or implied, in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for use. Eagle neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale, installation or use of its products, and Eagle makes no warranty whatsoever for products not manufactured by Eagle or with respect to any non-standard products supplied by Eagle hereunder. Eagle makes no warranty whatsoever in respect to products which have been subject to misuse, neglect, accident, or have been modified by an end user. Eagle shall have no liability for incidental or consequential damages of any kind arising out of the sale, installation or use of its products.

1: GENERAL INFORMATION

SERVICE POLICY AND PROCEDURE

1. Out of warranty repairs by Eagle will be serviced expeditiously at a rate of \$65.00/hour (two hour minimum), plus parts and shipping charges. (Hourly rate subject to change without notice.)
2. Shipments arriving at Eagle without a "Service Return Authorization" (SRA) number WILL NOT BE ACCEPTED and will be returned to the dealer at his cost regardless of warranty status.

RETURN PROCEDURE

1. Upon determining that repair services are needed, the dealer must call his Distributor. The distributor must then do the following:
 - a. Call the Eagle Customer Support Department at(408) 378-1750, and obtain a SRA number.
 - b. Route the shipment directly to the address designated by the service representative.
2. Upon completion of the services required, an invoice will be issued stating charges (when applicable) and work completed. A copy will be enclosed in the return shipment with additional copies mailed separately to the dealer. Eagle will prepay return shipment if the item was under warranty.
3. The authorized Eagle Dealer Service Center will invoice the end user directly. Payment terms are net 30 days from invoice date and payable to Eagle at the address indicated on the invoice. Payments must refer to the SRA number.

1: GENERAL INFORMATION

COMPLAINTS

All complaints concerning service related matters should be channeled directly to Eagle Computer, Inc., at the following address:

Eagle Computer, Inc.
983 University Avenue
Los Gatos, California 95030
Attn: Vice President, Operations
(408)395-5005

2: INSTALLATION AND CHECKOUT

PRELIMINARY INSPECTION

This section describes the unpacking, inspection, installation, and initial checkout of Eagle I-IV Computers and the File 10 Hard Disk Storage Unit. The following precautions apply to inspection and treatment of the shipping containers when they arrive:

- * Always keep the shipping containers in an upright position.
- * Carefully inspect the containers for external damage in the presence of the shipper.
- * Write a description of any external damage to the shipping container on the bill of lading before signing it and accepting the delivery.

2: INSTALLATION AND CHECKOUT

UNPACKING

When unpacking a system, inspect it for any evidence of shipping damage. If such evidence is discovered, stop unpacking and immediately notify the shipper and arrange to have the shipment inspected by the shipper's agent or authorized representative. All damage claims should be promptly filed with the shipper.

UNPACKING PROCEDURE FOR EAGLE I-IV

CAUTION

The Eagle IV contains a Winchester Hard Disk Drive. Jarring or carelessly handling the unit can irreparably damage the drive.

1. Prepare a suitable work station.
2. Place the shipping container upright, on a suitable work space.
3. Remove packing slip (if present).
4. Cut the strapping and open the top of the container.
5. Remove the documentation and styrofoam insert from the top of the container.
6. Remove the foam shipping block from the top of the system.
7. Lift the shipping container off the base section.
8. Remove the plastic bag from the system.
9. Place a hand under each side of the system and lift the system out of the container.
10. Place the system on the work station.

UNPACKING (CONT'D)

UNPACKING PROCEDURE FOR THE FILE 10

CAUTION

The File 10 contains a Winchester Hard Disk Drive. Jarring or carelessly handling the unit can irreparably damage the drive.

1. Prepare a suitable work station.
2. Place shipping container upright on a suitable work space.
3. Remove packing slip.
4. Cut strapping.
5. Open the top of the container.
6. Remove the I/O cable and AC cord.
7. Place a hand under each side of the unit and carefully lift the unit out of the container.
8. Place unit on work station.

2: INSTALLATION AND CHECKOUT

INSTALLATION

SITE REQUIREMENTS

The small size and integrated design of the Eagle computer provides considerable flexibility in selecting a suitable location. In most cases, any environment suitable for the operator will be fine for the system; however, extremes of temperature and humidity should be avoided. Electrical requirements are as follows:

1. Properly grounded three-hole outlet.
2. AC voltage within the limits established in Appendix B of this manual.
3. No motor-driven appliances such as refrigerators, air conditioners, copiers, collators, etc., on the same AC line.

EAGLE I-IV INSTALLATION PROCEDURE

1. Place the unit on the work station.
2. Remove the cardboard inserts from the disk drive(s).
3. Insure the ON/OFF switch, located on the left corner of the back panel, is in the OFF position.
4. Plug the power cord into the AC outlet.

FILE 10 INSTALLATION PROCEDURE

1. Position the File 10 unit on one side of the Eagle computer.
2. Eagle II-III/File 10 Connection:
 - a. Connect one end of the 37-pin I/O cable to Parallel Port A on the back of an Eagle II or III. Make sure the polarity arrow on the cable coincides with the polarity arrow on the connector.
 - b. Connect the other end of the I/O cable from Eagle II or III to the Parallel Port A on the back of the File 10.

(CONT'D)

2: INSTALLATION AND CHECKOUT

INSTALLATION (CONT'D)

FILE 10 INSTALLATION PROCEDURE (CONT'D)

3. Eagle IV/File 10 Connection:
 - a. Connect one end of a 50-pin I/O cable to the SYSTEM INTERFACE port on the back of an Eagle IV.
 - b. Connect the other end of the 50-pin I/O cable to the SYSTEM INTERFACE port on the back of the File 10, again making sure the polarity arrow on the cable coincides with the polarity arrow on the connector.
4. Plug in the File 10 power cord to the File 10.
5. Insure the File 10 ON/OFF switch on the back panel is in the OFF position.
6. Plug in the File 10 power cord to the AC outlet.

2: INSTALLATION AND CHECKOUT

INITIAL CHECKOUT

The following steps describe the initial checkout procedure. If at anytime the system fails to perform as described here, refer to SECTION 4: HARDWARE MAINTENANCE and SECTION 5: SOFTWARE MAINTENANCE to isolate and correct the fault.

NOTE

In this manual the use of two brackets [] encasing a letter or a word denotes a key on the Eagle keyboard. For example, [RETURN] refers to the key with the printed word "RETURN". The plus symbol (+) placed between two keys, such as in [SHIFT]+[TAB], is an indication that the two are to be pressed simultaneously.

EAGLE I-III WITHOUT FILE 10

1. Remove all disks from the disk drives.
2. Install the parallel and serial port loop back cables.
3. Switch on the power switch.
4. Hold down the [T] key on the keyboard.
5. Press the RESET button.
6. Release the [T] key. This triggers the system diagnostic tests. A display will appear on the CRT describing each test and the number of passes the test has completed.
7. After ten successful passes, complete the checkout procedure by performing the Disk Drive Diagnostic Test described in SECTION 4: HARDWARE MAINTENANCE.
8. After successful completion of the System and Disk Drive Diagnostic Tests, the system initial checkout procedure is completed.

2: INSTALLATION AND CHECKOUT

INITIAL CHECKOUT (CONT'D)

EAGLE IV, AND EAGLE II-III WITH FILE 10

NOTE

For the Eagle to operate a File 10, the boot PROM on the main board must be of Revision 3.01 or higher

1. Remove all disks from the disk drive(s).
2. Install the serial and parallel loop-back cables.
3. Hold down the [T] key.
4. Turn on the File 10 power switch located on the back panel. The File 10 is first on, last off in the ON/OFF sequence.
5. Turn on the Eagle computer power switch located on the left corner of the back panel.
6. Release the [T] key. This triggers the system diagnostic tests. A display will appear on the CRT describing each test, and the number of passes the test has completed.
7. After ten successful passes, complete the checkout procedure by performing the Hard Disk Read Only Test, the Controller Test, and the SASI - Centronics Loop Back Test described in SECTION 4: HARDWARE MAINTENANCE.

CAUTION

Before turning off the power to a hard disk system, the Winchester Disk Drive head must be retracted to the Track "0" position. This is accomplished by properly exiting from the programs. Back through the menu system until the message "REMOVE YOUR DISKETTES AND TURN OFF POWER" or a similar message is displayed on the CRT. Failure to do so can damage the drive.

2: INSTALLATION AND CHECKOUT

PRINTER INSTALLATION

SERIAL INPUT/OUTPUT PORTS

The Serial I/O Ports on all Eagle computers are identical, user-definable, and may be programmed as output ports to serial printers. Refer to the procedure below to assign Printer Port Parameters. Refer to Appendix A for pin assignments to both serial ports. The appendix also includes the pin assignments for sample printer and modem cables/connectors.

PARALLEL OUTPUT PORT

The output port for parallel printers on Eagle I-III systems is Port B, on Eagle IV systems the port is labelled "PARALLEL PRINTER". This port is a CENTRONICS compatible interface. Any printer designed for CENTRONICS compatibility will function properly with proper connection of the ribbon cable between the printer and the Eagle printer port. Refer to Appendix B for pin assignments to this port.

SETTING THE SYSTEM PRINTER PORT PARAMETERS

The port parameters facilitate communications between the Eagle computer and a peripheral device (printer). To assign the parameters in accordance to the printer requirements, use the following procedure. The procedure is menu-driven: a new question will appear after the current one is answered.

1. Select "Set the system parameters" option from the Main Menu.
2. Select the "Select the line printer" option, from the displayed menu.
3. Type the letter which corresponds to the printer's type and the port to which it will be connected. (For parallel printers, skip to Step 7.)
4. Type the letter corresponding to the printer's baud rate.
5. Press [Y] for "Yes" if it requires a "busy signal". If not, press [N] for "No".

(CONT'D)

2: INSTALLATION AND CHECKOUT

PRINTER INSTALLATION (CONT'D)

SETTING THE SYSTEM PRINT PORT PARAMETERS (CONT'D)

6. If the printer requires a "busy signal", indicate whether that signal will be low, by pressing [L], or high, [H].
7. Control characters perform special printing functions such as condensed or enlarged printing with dot matrix printers. If you will not be using this option, press [N]. To enter control codes, press [Y] then enter the decimal equivalent for the control characters, and press the [RETURN] key.
8. Press the [RETURN] key to exit from the option and move on to the next menu.
9. If the printer brand is listed, type in the corresponding letter. For nonprecision or dot matrix printers, press [1]. If the printer is not listed, select the option with the closest resemblance. The next question on the monitor refers to saving the parameters.
10. Press [Y] to save the printer port parameters on the disk. The parameters will then automatically load whenever the system (Eagle IV or File 10) or program diskette (Eagle I-III) is used.
11. Test the assigned parameters by selecting Option 6. The printer should respond by repeating a pattern of characters. Stop the test by pressing the [ESC] key.
12. If the Printer does not function properly on initial installation, refer to the instruction manual that comes with the printer. Then, consult with the printer supplier to check that you have the proper printer parameters.

2: INSTALLATION AND CHECKOUT

PRINTER INSTALLATION (CONT'D)

SETTING THE PARAMETERS FOR A MODEM

A modem will enable the Eagle computer to communicate via the regular phone lines with another computer, printer or other peripheral device. The procedure for setting modem parameters is exactly the same as for a printer, described previously. The final settings, however, will be determined by the type of modem used, the software communication package, and the device at the other end of the phone line.

SETTING PARAMETERS WITHOUT A PERIPHERAL DEVICE

The Eagle can be operated without a printer, modem or other peripheral device. However, to prevent the system from appearing to be locked up should the user inadvertently issue a print command, the parameters should be set to the assignments shown below by using the System Printer Port Parameters Procedure.

Port:	Serial A
Baud Rate:	9600
Busy Signal:	No

INTRODUCTION

Eagle I-IV systems are built around a single processor board to make system troubleshooting and repair as easy as possible. This board is referred to as the "Main Board" and is located in the base of the system. It contains all the circuitry necessary to support the keyboard module, the CRT module, the floppy disk drive modules, a hard disk drive port, two RS-232 serial ports, and a parallel printer port. The main board is designed around the Zilog Z80A microprocessor and its associated component family.

The power supply module and the keyboard module are also located in the base assembly. The power supply provides the three voltages necessary to run the system: +5 volts, +12 volts, and -12 volts. The CRT module, the floppy disk drive modules, the fan, and the hard disk drive module (when installed) are located in the housing above the base assembly. Figure 1 shows a block diagram of the Eagle system.

3: SYSTEM OVERVIEW

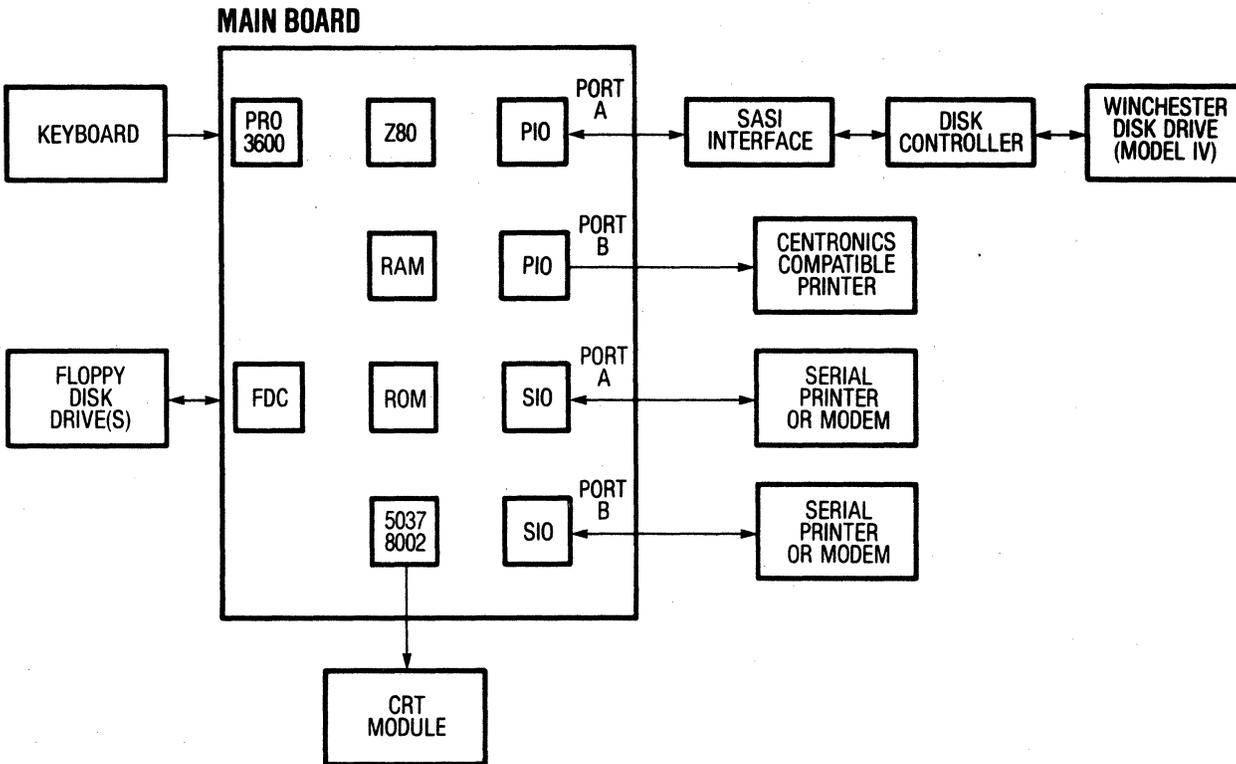


FIGURE 1: EAGLE SYSTEM BLOCK DIAGRAM

MAIN BOARD MODULE

The main board is the core of the system. It consists of the following components:

- * 64K of program memory (RAM)
- * Z80A Microprocessor
- * Z80A Direct Memory Access LSI(DMA)
- * Two Z80A Parallel Input/Output LSI's(PIO)
- * Z80A Dual Asynchronous Receiver/Transmitter LSI (DART)
- * Floppy Disk Controller LSI
- * Z80A Counter Timer Circuit(CTC)
- * Video output circuitry
- * Keyboard encoder LSI.

On-board data transfer is done via an 8 bit data bus and a 16 bit address bus. Figure 2 shows a block diagram of the system buses. Figure 3 shows the main board component layout.

CENTRAL PROCESSING UNIT Z-80A

The Z80A Microprocessor chip is the "brain" of the system. It consists of an eight bit data bus, a 16 bit address bus, six system control lines, five CPU control lines, two CPU bus control lines, and 208 bits of read/write memory in the form of 16 general purpose and flag registers. The Z80A requires only a single +5 volt supply, runs at 4 MHz on a single clock input, and has a minimum 1.0 microsecond instruction execution time.

The Z80A processes each line of a program run on the system, makes all operational decisions, and issues commands to the various device controllers. These tasks are performed according to a specific set of instructions, the Z80A Instruction Set. The Z80A Instruction Set has 158 instructions.

DIRECT MEMORY ACCESS CONTROLLER (Z80A DMA)

The Z80A Direct Memory Access Controller LSI is specifically designed to aid the Z80A microprocessor in transferring blocks of data between locations in the main memory, between the main memory and peripheral devices, or between any two peripheral devices. The Z80A DMA Controller does this independently of the CPU to free the Z80A from the tedious task of block data transfer.

3: SYSTEM OVERVIEW

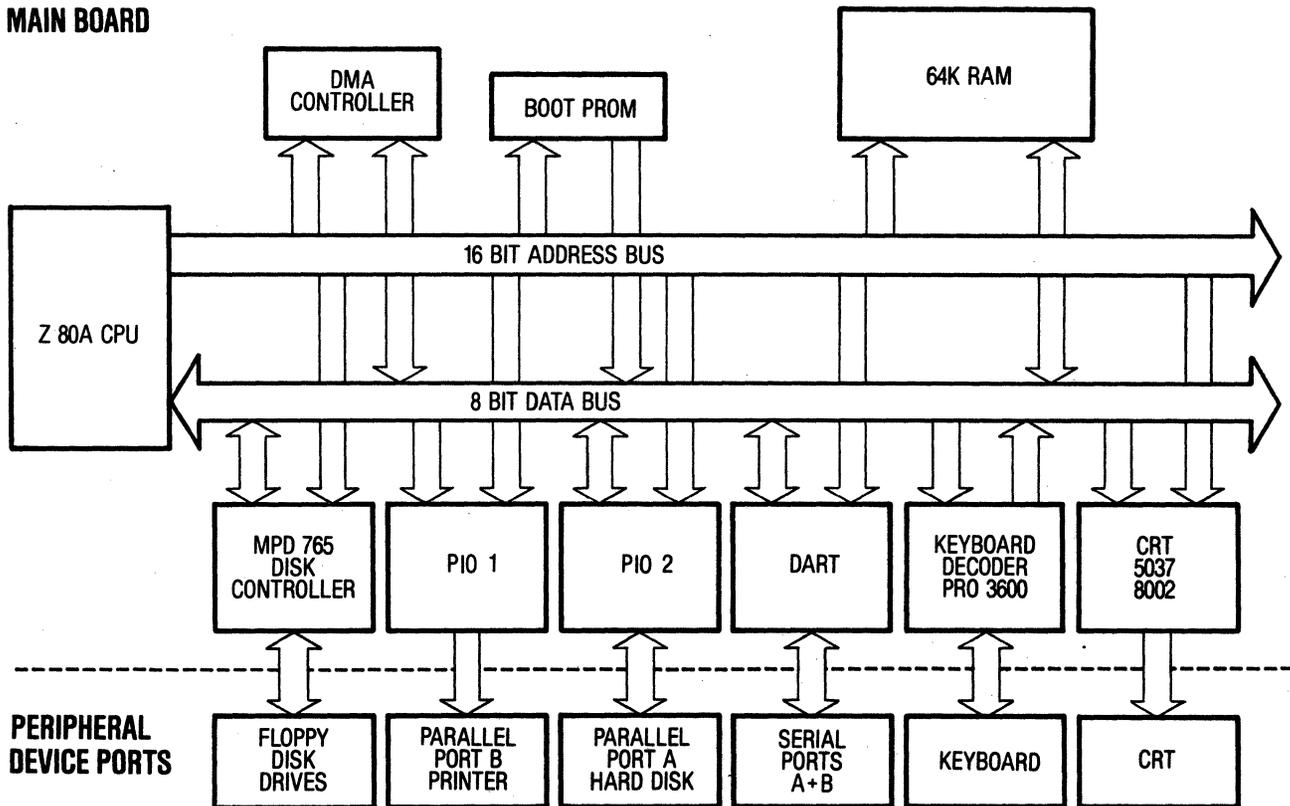


FIGURE 2: EAGLE SYSTEM BUSES

3: SYSTEM OVERVIEW

MAIN BOARD MODULE (CONT'D)

PARALLEL INPUT/OUTPUT CONTROLLER (Z-80 PIO)

The Z80A PIO is a bidirectional input/output device designed specifically to interface between the Z80A CPU and peripheral devices requiring parallel data transfer. Each PIO has two parallel ports, A and B. In all Eagle systems, the PIO's are used in such a way that only Port A is used for data transfer. Port B is programmed to monitor the status of a peripheral device.

When data transfer is to take place, eight bits of data are shifted into the PIO's internal registers and then gated out to either the CPU or the peripheral device by activating the appropriate control lines on the PIO. The PIO also monitors the status of the peripheral device connected to it and will interrupt the CPU when necessary in response to an active status line.

PIO 1

PIO 1 is used only to output data to a printer requiring a parallel interface. It is connected to the system Parallel Port B located on the back of the base assembly. Figure 4 shows the Parallel B Printer Port.

PIO 2

PIO 2 is the communications interface between the main board and a hard disk drive. Data transfer is, of course, bidirectional and is done through the system Parallel Port A located on the back of the base assembly. Figure 5 shows the Parallel A Hard Disk Port.

DUAL ASYNCHRONOUS RECEIVE TRANSMITTER (Z80A DART)

The Z80A DART is a two channel, full duplex, asynchronous, parallel/serial converter controller. When used with a modem for data communications, it can transmit or receive 5 to 8 bits per character at 75-9600 baud.

It also provides for the addition of 1, 1-1/2, or 2 stop bits, and optional even or odd parity. Each channel has all the necessary handshake signals to interface with either a modem or serial printer. DART supports Serial Port A and Serial Port B, both of which are user-definable and are located on the back of the base assembly. Figure 6 shows the Z80A DART schematic breakout.

3: SYSTEM OVERVIEW

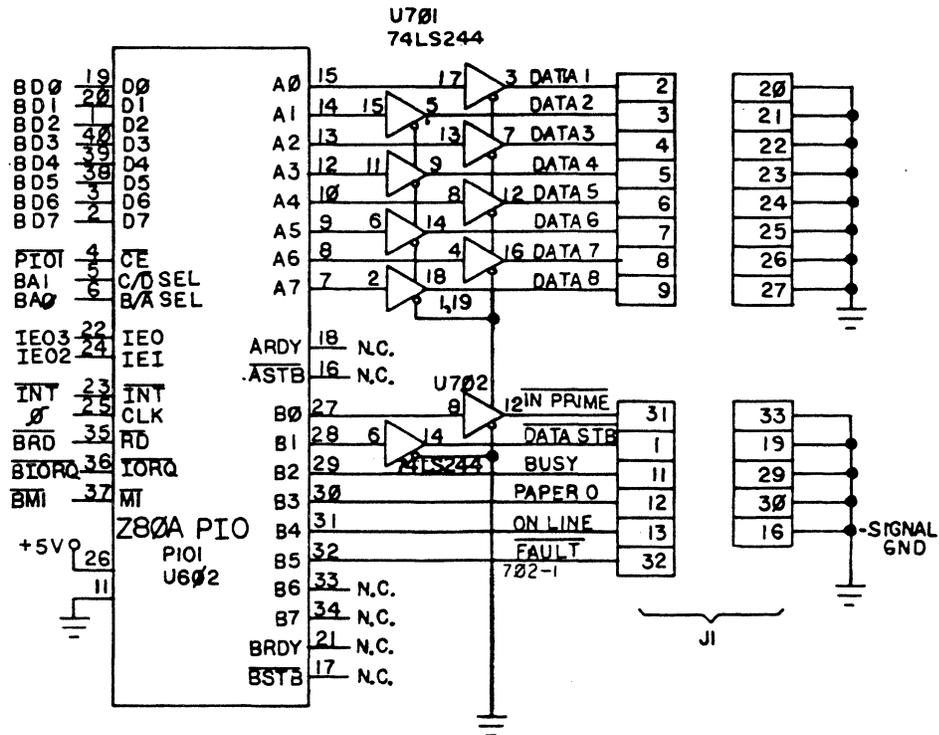


FIGURE 4: PARALLEL B PRINTER PORT

3: SYSTEM OVERVIEW

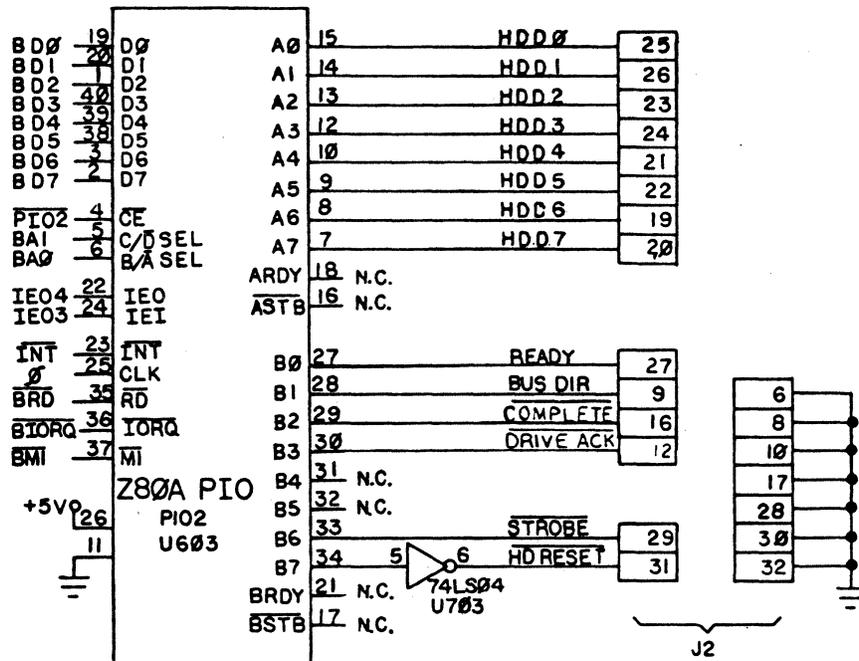


FIGURE 5: PARALLEL A HARD DISK PORT

E, I, II, III

NOT IV

3: SYSTEM OVERVIEW

*J3 + J4 ON BOARD
OUTSIDE CANN DIFFERENT*

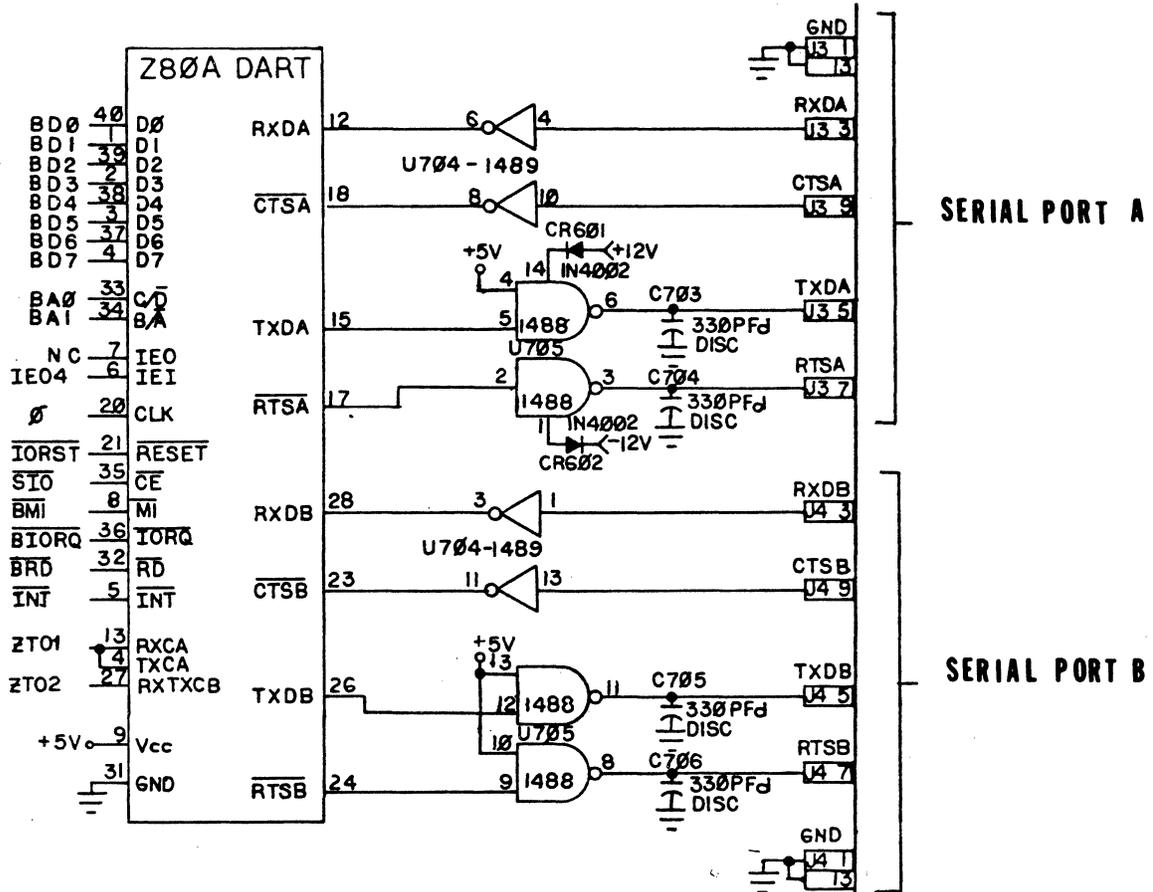


FIGURE 6: Z-80A DART SCHEMATIC BREAKOUT

3: SYSTEM OVERVIEW

MAIN BOARD MODULE (CONT'D)

FLOPPY DISK CONTROLLER (MPD 765)

The MPD 765 is a LSI Floppy Disk Controller chip containing all the circuitry and control functions to interface the Z80A microprocessor with the floppy disk drives. The MPD 765 will execute 15 separate commands: Read Data, Read ID (SECTOR ID FIELD), Read Track, Write Data, and Format Track, etc.

When the floppy disk controller receives one of these instructions from the microprocessor, it issues control signals to the floppy disk drives to perform the desired function (these signals are described in Table 2).

The MPD 765 also monitors the disk drive status, converts serial/parallel data, and performs error checking on transferred data. If the controller encounters an error in the data or a drive malfunction, it will interrupt the microprocessor and give it fault status information. Figure 7 shows the MPD 765 schematic breakout.

KEYBOARD ENCODER (PRO 3600)

The PRO 3600 decodes the two inputs from the keyboard. It also outputs to the system bus the ASCII code for the key that was pressed by running an X and Y output line to each key on the keyboard.

When a key is pressed, the X and Y line to that key are shorted together. The PRO 3600 senses this change by constantly polling its X and Y lines. It decodes the change in line status and outputs to the system bus the ASCII code corresponding to the key that was depressed. Figure 8 shows the PRO 3600 schematic breakout.

TABLE 2: FLOPPY DISK CONTROLLER INTERFACE SIGNALS

Interface Signal	Function
STEP	A one microsecond minimum low pulse on this line will move the heads to one track.
DIRECTION	A low on this line will set head step direction towards Track 79. A high on this line will set head step direction towards Track 0.
MOTOR ON	A low on this line starts the spindle motor.
WR ENABLE	A low on this line enables the write gate on the floppy disk drive.
WR DATA	This line carries the composite write clock and coded data from the Floppy Disk Controller.
RD DATA	This line carries the composite clock and coded data signal to the Floppy Disk Controller.
DRIVE SEL 0	A low on this line enables Disk Drive A.
DRIVE SEL 1	A low on this line enables Disk Drive B.
SIDE SELECT	A low on this line enables the upper head on a double sided disk drive. A high on this line enables the lower head.
TRACK 00	A low on this line indicates the heads are positioned over Track 0, the home position.
WR PROTECT	A low on this line indicates to the floppy disk controller that the write protect switch is closed (i.e., the write protect tab is on the diskette).

E-IV
 HARD A,B
 FLOPPY IS E,I
 E: D/S
 I: S/S

DISKETTES FORMATTED EARLY 4E
 80 T 5 SECTOR

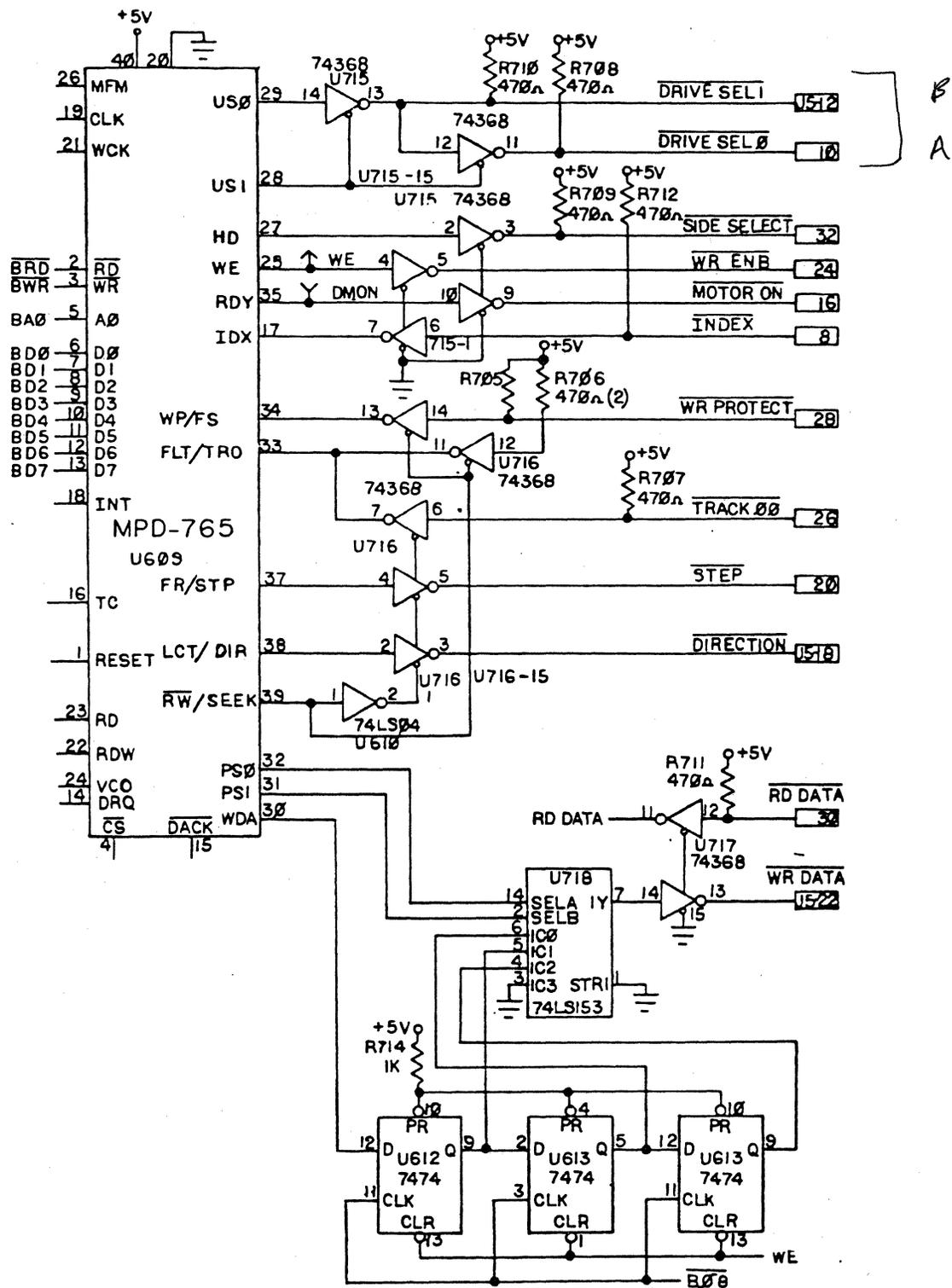


FIGURE 7: MPD 765 SCHEMATIC BREAKOUT

3: SYSTEM OVERVIEW

→ ASCII

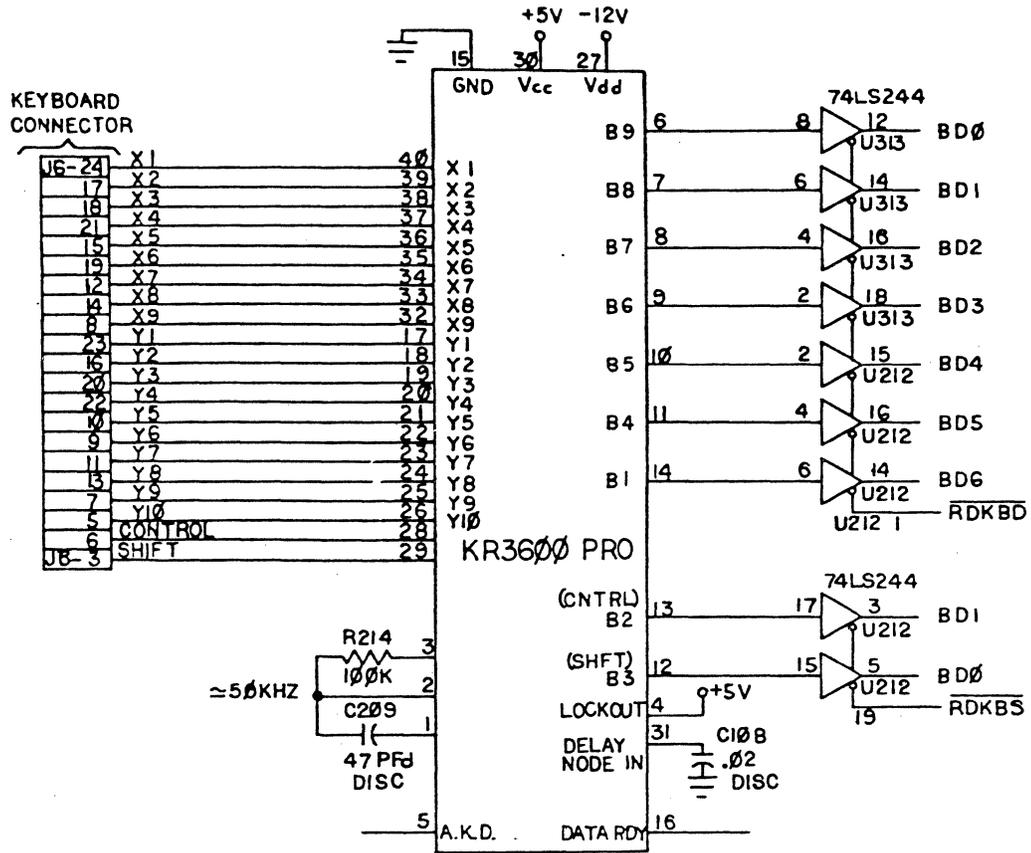


FIGURE 8: PRO 3600 SCHEMATIC BREAKOUT

3: SYSTEM OVERVIEW

MAIN BOARD MODULE (CONT'D)

BOOT PROM (272A)

The 2732A Boot Prom is an EPROM with 4K bytes of program stored in ROM for system boot-up and initial system diagnostics. The EPROM is preprogrammed with a short sequence of instructions known as the Bootstrap Program. When power is first applied to the system or the system RESET button is pressed, this program accesses the disk drive containing the system software, loads that program into memory, and then hands over system control to it.

The EPROM also contains a system diagnostic test that will run a sequence of tests on the main board to insure its integrity prior to loading the system software. This test is performed by pressing the [T] key immediately after system powerup or system reset.

CRT 8002 & 5037

The 8002 Video Generator LSI and the 5037 Video/Timer Controller LSI make up the majority of the video section. The 8002 contains a predetermined character set, 128 alphanumeric characters and graphics symbols. When a character is to be output to the CRT, the address of the character is placed on the address bus of the 8002 by the microprocessor. When the 8002 is selected, this character address is input to the 8002. Then, in time with the video dot clock, the character selected is output in serial fashion to the CRT.

The only attribute selection used by the Eagle system is reverse video. When reverse video is selected, the reverse video line is pulled high and the character data is inverted, before it is placed in the serial output shift register of the 8002.

The other part of the video section is the 5037. This LSI is not preprogrammed. It is programmed with seven 8-bit words that define for the 5037 the horizontal and vertical format of the CRT display. This information is stored in the 2732-A Boot EPROM and loaded as part of the initial loading sequence. The information includes the size of the display, the size and spacing of the character blocks, and the vertical and horizontal scan rate. The 5037 also provides the cursor mode information to the 8002.

CRT MODULE

The monitor is a Motorola 12 inch monitor containing its own power supply and requires only a single AC input (110 VAC, 60 Hz; or 220 VAC, 50 Hz). The video signal, horizontal sync, and vertical sync are provided via a small ribbon cable from the main board module. The monitor provides adjustments for the +24 volts, horizontal hold, vertical hold, horizontal delay, vertical linearity, vertical size, master brightness, focus, and horizontal width. Adjustment procedures can be found in SECTION 4: HARDWARE MAINTENANCE.

DISK DRIVE MODULE

The disk drive module in the Eagle I-III consists of one or two single or double sided floppy disk drives. The Eagle IV consists of one double sided floppy disk drive and one Winchester hard disk drive. The configuration and data storage capacity of each Eagle system are listed in the Technical Features Table in SECTION 1: GENERAL INFORMATION. The floppy disk drives and the Winchester disk drives are discussed in the following paragraphs.

FLOPPY DISK DRIVES

*PREACT
BACK UPS*

*CLEAN DISKETTE
ONCE / month
20 / cleanings per DISKETTES*

The floppy disk drive units each consist of read/write and control electronics, drive motor, drive mechanism, read/write head, and track positioning mechanism. The floppy disk drives have four basic functions:

1. Receive and process control signals.
2. Position the read/write head on a selected track.
3. Stop, start, and regulate the speed of the spindle drive motor.
4. Write data to or read data from the disk.

All floppy disk drive functions are controlled by the MPD 765 floppy disk controller LSI located on the main board. The disk drives themselves contain no decision making circuits. Floppy Disk Drive Interface Signals are listed in Table 2. Figure 9 shows the floppy disk drive functional diagram.

WINCHESTER DISK DRIVES

"QUIT" POWER DOWN ROUTING

The Winchester disk drives perform the same functions as the floppy disk drives. The hard disks have a higher track density, and are composed of multiple, rigid, nonremovable disks. All control and decision-making circuits for the Winchester disk drive are located on the Winchester disk controller board.

3: SYSTEM OVERVIEW

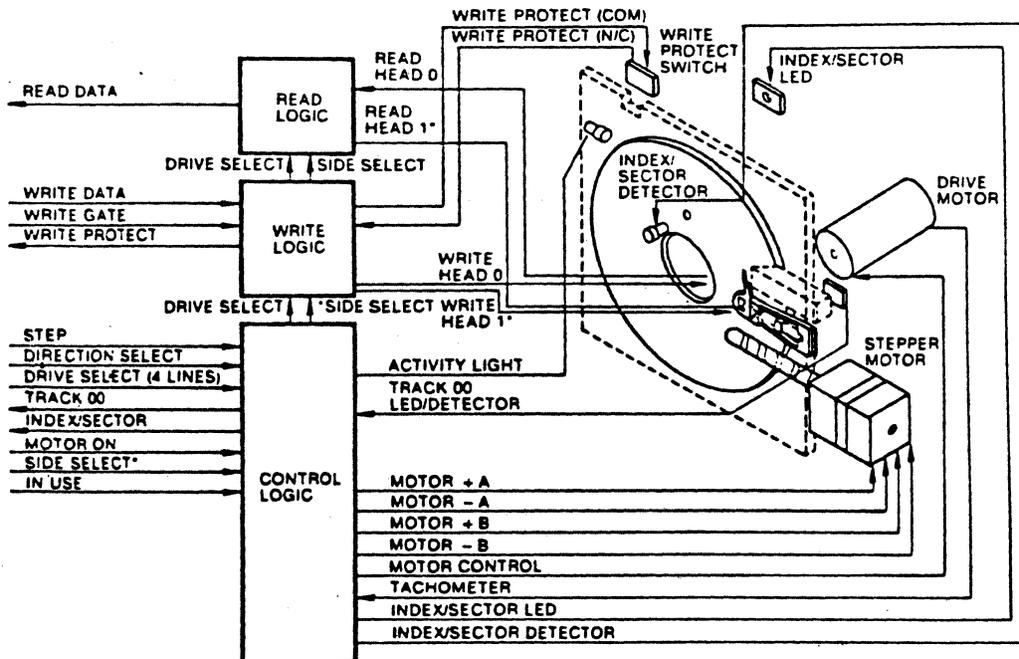


FIGURE 9: FLOPPY DISK FUNCTIONAL DIAGRAM

KEYBOARD MODULE

The Eagle systems use a mechanical switch-type keyboard. Each key is connected to two lines of a grid, which consists of an X axis and a Y axis. The X and Y lines are connected via an I/O cable to the X and Y lines of the PRO 3600 keyboard encoder chip on the main board. When a key is pressed, the gold plated leaf springs in the key module make contact, connecting the X and Y lines at that key module. This is sensed by the encoder chip, decoded to the ASCII code for the key that was pressed, and output onto the data bus.

POWER SUPPLY MODULE

ARTEC *NOT USER SWITCHABLE 60 to 50 CYCLE*
 The power supply module uses a switching-type power supply. It is jumper-selectable to operate on either 110 VAC, 60 Hz or 220 VAC, 50 Hz. Three output connectors all provide + 5 VDC, +12 VDC and -12 VDC to the various system modules, shown in Table 3 below. No voltage adjustments are necessary.

TABLE 3: POWER SUPPLY VOLTAGES

VOLTAGE	EAGLE I - III MODULES	EAGLE IV MODULES
+5 Volts	Main Board Floppy Disk Drives	Main Board Floppy Disk Drives Winchester Controller SASI Interface Hard Disk Drive
+12 Volts	Main Board Floppy Disk Drives	Main Board Floppy Disk Drives Winchester Controller Hard Disk Drives
-12 Volts	Main Board	Main Board
+5 Volts (Eagle IV Only)	N/A	Hard Disk Drives

3: SYSTEM OVERVIEW

WINCHESTER CONTROLLER MODULE

IV ONLY

The Winchester Controller Module consists of one printed circuit board used solely for interfacing Winchester disk drives to the main board module. The Winchester controller receives requests for drive access from the microprocessor via parallel port A of the main board. The controller then provides all the head positioning commands to the Winchester disk drive (as well as serial/parallel data conversion, error checking, and drive status monitoring). The controller uses an 8 bit processor and Prom to oversee the operation of the various LSI's, a Serdes Parallel/Serial converter, a data separator to change the NRZ data from the Serdes to MFM format for the drive, and a full sector buffer.

SASI INTERFACE MODULE

IV ONLY

The Eagle IV SASI Interface Module provides additional buffering to the I/O lines between the XEBEC Controller and the hard disk port on the main board. The SASI module is located under the main board in an Eagle IV.

INTRODUCTION

The objective of field maintenance and repair is to minimize downtime by rapidly isolating and resolving system faults. This objective is aided by the Eagle's modular design which limits the number of replaceable parts to major assemblies. The relatively small number of parts simplifies troubleshooting and minimizes repair time.

This section presents preventative maintenance procedures, diagnostic tests, fault isolation, and removal and replacement procedures.

MAINTENANCE PRECAUTIONS

The following rules of good maintenance are presented to help Field Service personnel minimize system downtime, prevent equipment damage, prolong useful life of the equipment, and avoid personal injury.

- * ALWAYS exercise extreme caution when working on or near the power supply module. The filter capacitors retain a significant charge, even when the system is turned off.
- * ALWAYS discharge the CRT high voltage circuit before removing the CRT module. This circuit retains 30,000 volts even when the power is turned off. Follow the recommended procedure for CRT removal found in this section of the manual.
- * NEVER remove or install a fuse while the AC power cord is plugged into the AC outlet.
- * NEVER connect or disconnect any system cable with the power on.
- * Keep all modules clean and free of foreign matter.

4: HARDWARE MAINTENANCE

SPECIAL HANDLING INSTRUCTIONS

CRT MODULE

The CRT Monitor Assembly can be easily damaged. Observe the following precautions when handling a CRT module.

- * NEVER store, transport, or ship a CRT module in any container other than an original shipping container. If necessary, order a proper container for shipping.
- * NEVER handle a CRT roughly. Do not scratch it, strike it with hard or sharp objects, handle it by the neck, or allow a hot soldering iron or hot solder to touch it.
- * NEVER allow direct sunlight to strike the face of the CRT. Permanent damage to the phosphor will result and may require replacement of the CRT module.
- * Cover the face of the CRT with a soft cloth or the protective film that covered the replacement before shipping a CRT module.
- * Do not make any adjustment to any part of the CRT module that is not specifically described in this manual.

EAGLE IV & FILE 10

Due to the nature of the hard disk drives it is very important to handle them with the proper care. When a hard disk drive is powered up, the read/write heads are unlocked and allowed to move across the disk surface. Unlike floppy disk drives, the heads in a hard disk drive must NEVER touch the disk surface. If they do, the disk surface and the read/write heads will be damaged and all recorded data will be lost.

Included with every hard disk program is a menu option called "QUIT". This option retracts the read/write heads to the shipping position where they are held in place by either a magnet or a mechanical locking device. If this selection is not made, the heads remain unlocked, and any movement of the system may cause the irreparable damage.

4: HARDWARE MAINTENANCE

PREVENTATIVE MAINTENANCE

The preventative maintenance procedures that follow were designed to maintain system reliability and reduce downtime. Unless a procedure enhances this goal, it should not be used. With the exception of the maintenance procedure and adjustments presented in this manual, no action should be performed on equipment that is operating properly.

The following procedure should be performed every six months.

1. Turn off the power.
2. Disconnect the AC power cord.
3. Remove the covers from each module. (Refer to the appropriate headings in this section).
4. Visually inspect the interior of each module for dirt and foreign materials. Clean the interior, if necessary, with a can of compressed air.

CAUTION

Exercise care when cleaning the interior of the modules, especially around adjustment mechanisms. Inadvertent action may knock out alignments, requiring later troubleshooting and adjustment.

5. Carefully clean the face of the CRT with a good quality glass cleaner. Do not use any sharp objects to clean the CRT.
6. Verify that all connectors seat securely and are undamaged.
7. Inspect all wiring for signs of chafing, damage, or breakage. Replace any questionable wiring.

(CONT'D)

4: HARDWARE MAINTENANCE

PREVENTATIVE MAINTENANCE (CONT'D)

8. Reinstall all covers. (Refer to the appropriate sections).
9. Connect the AC power cord and turn the system on.
10. Verify that the system power supply output voltages are within tolerance.

NOTE

The system power supply must be under load to check its output voltages; because it is a switching type of power supply, it will switch off when no load is present.

11. Perform disk drive head cleaning with a recommended head cleaning disk.
12. Perform all diagnostic tests.
13. Keep a log of inspection, faults, and repairs of each module for future reference.

SYSTEM DIAGNOSTICS

The Eagle computer diagnostic programs are divided into two basic groups. The System Test, or "T" Test, which is stored in the Boot Prom on the main board, will perform diagnostic routines on all major components of the main board. (Refer to Table 4 for definitions of the various tests.) The Disk Drive Diagnostics test the read/write ability of the disk drives.

All Eagle diagnostic tests are menu-driven and user friendly. This section explains the function of each menu selection and each diagnostic test. To respond to a system prompt, or select a desired menu option, simply press the appropriate key(s) indicated by the CRT display. In most cases, pressing the [ESC] key will abort the procedure currently in progress and return the system to the starting menu.

"T" TEST SYSTEM DIAGNOSTIC

The "T" Test is a set of diagnostic programs that test the functions of the main board. These programs reside in the Boot EProm of all Eagle computers, and are executed by holding down the "T" key while turning on the system or while pressing the RESET button. An explanation of each test can be found in Table 4.

If the system should fail any one of the tests, it indicates trouble with the main board, which should then be replaced as soon as possible. To fully test the parallel and serial ports, the appropriate loop back cable should be installed before running the test.

4: HARDWARE MAINTENANCE

TABLE 4: SYSTEM "T" TESTS

TEST	FUNCTION
RAM	Writes a unique data pattern throughout the 64K of onboard RAM, then reads it back and checks for errors.
DMA	Writes a unique data pattern into a specific area of the RAM. It uses the Direct Memory Access (DMA) circuitry to move this block of data to another location in RAM, then verifies it was done without error.
SIO	Uses the DART chip to send data out one serial port and receive it in the other via the loop back cable. It then checks the data for errors. The procedure is repeated in the opposite direction.
PIO	Uses the two Parallel Input Output IC's to send data out one parallel port and receive it in the other. It then checks the data for errors.

SYSTEM DIAGNOSTICS (CONT'D)

**DISK DRIVE
DIAGNOSTICS**

There are two disk drive diagnostic programs, each stored on a separate diskette.

Disk Diagnostics

Tests the floppy disk drive(s), either single or double sided, on all models. This test requires a blank, formatted diskette for each drive.

**Hard Disk Test &
Initialization**

Tests the floppy disk and the hard disk drive of an Eagle IV and Eagle II & III models with File 10's. It also contains the utilities to format and initialize a hard disk drive.

Disk Diagnostic

The Eagle Disk Diagnostic tests the read/write circuitry of either single or double sided floppy disk drives. The test is executed as follows:

1. Turn on the system.
2. Insert the diagnostic program disk into the "A" disk drive.
3. Press the RESET button.

Once the program is loaded, the test automatically begins. Answer the clearly stated system prompts, and insert blank, formatted diskettes into the drives when instructed to do so by the CRT display.

Fault diagnosis and isolation module is performed by the program automatically. The CRT will display a message that the system and media are good. If a drive or the media fail, the CRT display will show which failed and what to replace.

4: HARDWARE MAINTENANCE

SYSTEM DIAGNOSTICS (CONT'D)

Hard Disk Test & Initialization

The Hard Disk Test and Initialization disk provides a set of four programs to test all aspects of hard disk operation, as well as hard disk format and initialization functions. This section explains each of these programs. To operate the test:

1. Turn on the system.
2. Insert the test disk into the floppy disk drive (top drive for an Eagle II or III).
3. Hold down the [F] key and press the [RETURN] key.

The Hard Disk Utilities' Menu, shown in Figure 10, appears when the diagnostic disk is properly loaded into the system. The menu options are explained in the following pages.

EAGLE Computer Hard Disk Utilities

Please select option 5 before turning the POWER OFF

Your options are:

1. Perform hard disk tests.
2. Perform SASI - Centronics loop test
3. Perform floppy disk tests.
4. Initialize the software on hard disk.
5. Quit (move heads to shipping position).

Make your selection then press <RETURN>

FIGURE 10: HARD DISK UTILITIES MENU

SYSTEM DIAGNOSTICS (CONT'D)

Hard Disk Test and Initialization (Cont'd)

- 1. Perform Hard Disk Tests** This option contains all the tests and programs necessary to test the hard disk drive and its associated controller. When selected, the Hard Disk Test Menu, shown in Figure 11, appears. The individual selections and their functions are explained in Table 5.

NOTE

It is extremely important to remember that when a hard disk read/write test is run **ALL DATA IS LOST** that was originally on the disk. The files that are not to be erased must be copied to floppy disks before the read/write test is begun, and then later copied back to the hard disk. (Refer to "Backing up the Hard Disk Files" in the Hard Disk User's Manual.)

Hard Disk Format And Test - Version 1.10

What would you like to do?

Your options are:

- 1) Read only test
- 2) Short read and write test
- 3) Long read and write test
- 4) Controller Test
- 5) Format
- 6) End this program

Your choice please?

FIGURE 11: HARD DISK TEST MENU

4: HARDWARE MAINTENANCE

TABLE 5: HARD DISK FUNCTIONS

SELECTION	FUNCTION
1. Read Only Test	Performs a read operation on all tracks and sectors. Verifies that the data on the disk is readable and that the read circuitry is functioning properly. This selection DOES NOT destroy any recorded data.
2. Short read and write test	Writes a random data pattern to the hard disk, reads it back, and verifies it. Checks the surface of the disks for irreparable damage, and tests the read/write circuitry for proper operation. The initialization program MUST be run after this test to restore the system tracks, and to transfer the program files back to the hard disk. This test destroys all data on the disk.
3. Long read and write test	This is a long version of Selection 2.
4. Controller Test	This test checks the internal circuitry of the Winchester Controller Module.
5. Format	Rewrites the sector headers on new File 10 and Eagle hard disks. The Initialization Program MUST be run to restore the system tracks, and transfer the program files.

Hard Disk Test and Initialization (Cont'd)

**2. Perform SASI -
Centronics Loop Test**

Tests the I/O functions of the hard disk port in the main board module. A failure during this test indicates the main board, or the I/O cable attached to J1 or J2 of the main board is defective and should be replaced. The System Interface Parallel Printer ports loop-back cable must be installed before running this test.

**3. Perform Floppy
Disk Tests**

Tests the read/write functions of the floppy disk drives, and the floppy disks themselves. The Read Only test will perform a read operation on a disk without damaging the data previously written on the disk.

The short and long read/write test will write a random pattern to every track of the disk, read it back and check for errors. Blank disks **MUST** be used for this test since all data previously written to a disk will be destroyed.

**4. Initialize the Software
on the Hard Disk**

Restores the CP/M operating system and transfers program files to the hard disk. Before this initialization program is run, the Controller Test and the Short Read/Write Test should be performed to verify that the hardware involved is operating properly. For instructions on this option, refer to SECTION 5: SOFTWARE MAINTENANCE.

4: HARDWARE MAINTENANCE

FAULT ISOLATION

This section provides a method for determining defective modules and the cause of system failures. Once a defective module is identified, it should be replaced according to the procedures described in the Removal and Installation Procedures section. But, before any attempt is made, a preliminary system diagnostic shown in Table 5 should be performed.

Before attempting to diagnose any malfunction, all voltage levels should be checked. Eagle I - IV Computers are all built around a single CPU. This CPU and all its support circuits are contained in one main board module. All processing and control functions, with the exception of hard disk control, are performed by the main board, so fault isolation is very straightforward.

When a peripheral device such as the CRT module, floppy disk drive, keyboard module, or printer malfunctions, the cause can be one of two things: the affected module, or the main board. The following sections describe some of the failure symptoms associated with each particular module.

POWER SUPPLY MODULE

As with any system, the first step in properly isolating system failures is to verify that all operating voltages are correct. Table 6 shows the operating voltages. The power supply module contains no adjustments; if the input voltage is within tolerance but the output is not, the supply is defective and should be replaced before proceeding with the troubleshooting procedure. Remember, the switching type power supply must have a load on it for an output voltage to be present. To check it for the proper output, use the following procedure.

Power Supply Output Check Procedure

1. Open the base assembly.
2. Measure the fuse with an ohmmeter. For continuity, it should show no resistance. If it does, replace the fuse.
3. Turn on the system power.

(CONT'D)

FAULT ISOLATION (CONT'D)

Power Supply Output Check Procedure (Cont'd)

4. Measure the AC input (the black and white wires) for the proper voltage. AC voltage tolerances are listed in APPENDIX B: TECHNICAL SPECIFICATIONS.
5. Measure the output voltages on one of the power supply output connectors, J4 - J6 (all the same). If they are all present and within tolerance, no further checking is necessary. If not, continue with Step 6. DC voltage tolerances are listed in Table 4.
6. Turn off the system power.
7. Disconnect the output connector leading to the main board module.
8. Turn on the system power.
9. Check the output voltages. If they are now correct, replace the main board, if not, continue.
10. Turn off the system power.
11. Reconnect the main board module.
12. Disconnect the output connector leading to the disk drive module.
13. Turn on the system power.
14. Check the output voltages; if they are still not correct, replace the power supply module and retest.

4: HARDWARE MAINTENANCE

TABLE 6: SYSTEM POWER REQUIREMENTS

MODULE	INPUT	OUTPUT
Power Supply	110/220 VAC +/-15%	+5,+12,-12 VDC +/-5%
CRT	110/220 VAC +/-15%	N/A
Main Board	+5,+12,-12 VDC +/-5%	N/A
Fan	110/220 VAC +/-15%	N/A
Disk Drive	+5 VDC +/-5%, +12 VDC +/-10%	N/A
Keyboard	N/A	N/A
Winchester Controller	+5 VDC +/-5%, +12 VDC +/-10%	N/A
Hard Disk Drive	+5 VDC +/-5%,+12VDC +/-10%	N/A

MAIN BOARD MODULE

The main board module is the heart of the system. It contains the CPU, the RAM, and all the control circuits, with the exception of the Winchester disk controller module, for the entire system. Because of this, if the Main Board Module is defective, signs of failure will most likely appear with more than one system module. Examples of symptoms associated with a Main Board module failure are as follows:

- * No Boot-up sequence at all.
- * Incorrect data displayed on CRT
- * Erratic system operation
- * Failure of any of the "T" test diagnostics

FAULT ISOLATION (CONT'D)

CRT MODULE

Failures associated with the CRT can be broken down into two categories:

- * Incorrect raster display
- * Incorrect data displayed

The first, incorrect raster, is a failure of the CRT Module. The second, incorrect data, is a failure of the main board. The first step in isolating a CRT failure is to be sure the operating voltages, both high and low, are present. This is easily done following the procedure below.

1. AC voltage is present, but there is no glow on the CRT filament, the CRT module power supply is faulty. In this case if checking the CRT module's fuse shows it to be good, replace the CRT module.
2. If the filament is glowing, turn off the system and disconnect the I/O cable to the CRT module. Turn on the system and turn up the master brightness. A clearly defined square shape raster should be visible. If not, attempt to adjust it according to the adjustment procedures in this section.
3. If it still is not correct, replace the CRT module. Turn off the power and reconnect the I/O Cable. Turn the power back on. If you have the correct raster but no video display, or the incorrect data on the screen, the problem is with the main board.
4. If the data is displayed but it is misshapen, tearing or out of sync, and adjustments don't help, replace the CRT module.

FAN MODULE

The fan runs directly off the AC input with no controlling circuits. If there is AC on the fan power connector but the fan is not turning, or at the wrong speed, replace the fan.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES

The following pages describe the removal and installation procedures for the following modules:

- * Main Board Module
- * Power Supply Module
- * Disk Drive Module
- * Winchester Controller Module
- * Hard Disk Power Supply
- * Keyboard Module
- * Fan
- * CRT Module
- * CRT Module Adjustment

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

MAIN BOARD MODULE REMOVAL

1. Turn the system power off.
2. Disconnect the AC power cord from the AC outlet.
3. Place the system so that all sides can be easily accessed, with at least one foot of table space immediately behind it.
4. Remove the three screws found under the front edge of the system.
5. Remove the two screws found on the back of the base assembly.
6. Lift the top portion of the system slightly, then position it behind the base assembly with the CRT facing up.
7. Remove the I/O cables connected to the main board module.
8. Disconnect the DC power cable to the main board module, at the power supply module.
9. Remove the six screws holding down the main board module.
10. Remove the main board module.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

MAIN BOARD MODULE INSTALLATION

1. Place the main board module in the base assembly with the 64K RAM chips towards the front of the system.
2. Align the six holes in the PCB with the threaded holes in base assembly.
3. Install the six screws that hold the main board module in place.
4. Reconnect all the I/O cables and the DC power cable.
5. Put Glyptol on the six screws.
6. Place the top portion of the system back on top of the base assembly.
7. Reinstall the front and back screws.

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

**POWER SUPPLY
MODULE REMOVAL**

1. Turn the system power off.
2. Disconnect the AC power cord from the AC outlet.
3. Place the system so that all sides can be accessed with at least one foot of table space immediately behind it.
4. Remove the three screws found under the front edge of the system.
5. Remove the two screws found on the back of the base assembly.
6. Lift the top portion of the system slightly, then position it behind the base assembly with the CRT facing up.
7. Disconnect the input and output power cables.
8. Remove the four hex nuts holding the power supply module in place.
9. Remove the power supply module.

**POWER SUPPLY
MODULE INSTALLATION**

1. Place the power supply module in the base assembly.
2. Align the four holes in the PCB with the four threaded studs in the base assembly.
3. Install the four hex head nuts that hold the power supply module in place.
4. Reconnect the input and output power cables.
5. Place the top portion of the system back on top of the base assembly.
6. Reinstall the front and back screws.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

DISK DRIVE MODULE REMOVAL

1. Turn off the system power.
2. Disconnect the AC power cord from the AC outlet.
3. Remove the three screws on the back of the CRT/disk drive enclosure.
4. Remove the front bezel. Slip the front bezel removal tool between the top of the bezel and the top of the system, rotate the tool 90 degrees downward and pull gently.
5. Remove the top hex/slotted head screw on each side of the CRT/disk drive enclosure.
6. Remove the top of the CRT/disk drive enclosure.

NOTE

For Eagle IV's, disconnect the cables to the hard disk power supply.

7. Disconnect the I/O cable to the CRT module PCB.
8. Place the system so that it is easily accessed on all sides, with at least one foot of table space immediately behind it.
9. Remove the three screws under the front edge of the system.
10. Remove the two screws on the back of the base assembly.
11. Lift up the top portion of the system slightly, then position it behind the base assembly with the CRT facing up.

(CONT'D)

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

DISK DRIVE MODULE REMOVAL (CONT'D)

12. Remove three of the four screws holding the disk drive module in place.
13. Holding the disk drive module with one hand, remove the fourth screw holding the module in place.
14. Place the disk drive module on its back on a flat work surface.
15. Disconnect the I/O power and ground cables from the disk drive module.
16. Remove the disk drive module.
17. To remove the floppy or hard disk drives from the disk drive module, remove the two screws on each side of the drive.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

DRIVE CONFIGURATION

The configuration procedure must be performed on a floppy disk drive prior to its installation. The procedure requires the model and revision level of the drive. The model number can be found on the identification label on the drive belt side of the drive (Model Number 410 is a single sided drive and Model Number 460 is a double sided drive).

The revision level need only be determined for the Model 410. To determine the revision level, locate the power cable connector on the drive PCB. If it is aligned parallel to the drive's face plate, it is a revision B; if it is aligned perpendicular to the face plate, it is a revision C. Below is the procedure for configuring the floppy disk drives. The hard disk drives require no configuring.

NOTE

In the procedure below, model designations are for Shugart disk drives. Other manufacturers' model numbers follow in the parenthesis.

Model 410 B - Top (A) Drive (TM 100)

1. Locate the jumper chip on the PCB.
2. Cut pins 3, 4, 5 and 6.

Model 410 B - Bottom (B) Drive (TM 100)

1. Locate the jumper chip on the PCB.
2. Cut pins 2, 4, 5 and 6.
3. Locate the resistor pack (it is the only socketed IC on the board).
4. Remove the resistor pack.

Model 410 C - Top (A) Drive

1. Locate the pin jumper plugs on the PCB.
2. Install a plug on the pins labeled DS1.
3. Install a jumper plug on the pins labeled MS.
4. No jumper plugs should be on pins DS2, DS3 DS4 or MX.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

DRIVE CONFIGURATION (CONT'D)

Model 410 C - Bottom (B) Drive

1. Locate the pin jumper plugs on the PCB.
2. Install a jumper plug on pins DS2.
3. Install a jumper plug on pins MS.
4. No jumper plugs should be installed on pins DS1, DS3, DS4 or MX.
5. Locate the resistor pack (it is the only socketed IC on the board).
6. Remove the resistor pack.

Model 460 - Top (A) Drive (TM 400, 9409T)

1. Locate the pin jumper plugs on the PCB.
2. Install a plug on the pins labeled DS1.
3. Install a jumper plug on the pins labeled MS.
4. No jumper plugs should be on pins DS2, DS3, DS4 or MX.

Model 460 - Bottom (B) Drive (TM 400, 9409T)

1. Locate the pin jumper plugs on the PCB.
2. Install a jumper plug on pins DS2.
3. Install a jumper plug on pins MS.
4. No jumper plugs should be installed on pins DS1, DS3, DS4 or MX.
5. Locate the resistor pack (it is the only socketed IC on the board).
6. Remove the resistor pack.

330 Ω MUST GO ON DRIVE A

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

DISK DRIVE MODULE INSTALLATION

1. Configure the floppy disk drives according to the previous instructions.
2. Insert the drives into the disk drive module housing with the PCB side of the drive up and the "A" drive on top. The top of the housing is the narrower end when looking at it from the side.
3. Align the mounting holes in the enclosure with the four mounting holes in each drive.
4. Install the mounting screws.
5. Place the disk drive module on its top, behind the CRT/disk drive enclosure.
6. Connect all the I/O, ground and power cables to the drive(s).
7. Place the bottom of the drive module against the CRT/disk drive module housing so the mounting holes in the housing align with the mounting holes on the bottom of the drive module.
8. Supporting the drive module with one hand, install the mounting screws, but do not tighten them.
9. Align the mounting screws and washers with the outline in the Glyptol, and tighten the mounting screws.

NOTE

Reconnect the Eagle IV cables to the hard disk power supply.

10. Place the top of the system back on the base assembly.

(CONT'D)

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

**DISK DRIVE
MODULE INSTALLATION
(CONT'D)**

11. Reconnect the CRT module I/O cable.
12. Install the three (front) and two (back) screws.
13. Place the top of the CRT/disk drive enclosure back on the system, and reinstall the three back screws and the two front inside screws.
14. Snap the front bezel back into position.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

WINCHESTER CONTROLLER MODULE REMOVAL

1. Turn the system power off.
2. Disconnect the AC power cord from the AC outlet.
3. Place the system so that it can be accessed easily from all sides, with at least one foot of table space immediately behind it.
4. Remove the three screws under the front edge of the system.
5. Remove the two screws on the back of the base assembly.
6. Lift the top of the system slightly, then position it behind the base assembly with the CRT facing up.
7. Remove the I/O cables connected to the main board module.
8. Disconnect the DC power cable to the main board module, at the power supply module.
9. Remove the six screws holding down the main board module, and remove the main board module.
10. Remove the cables to the Winchester controller board.
11. Raise the bottom tray of the base assembly, lifting it by the front edge.
12. Remove the four screws from the bottom of the tray that hold the controller in place.
13. Remove the controller.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

WINCHESTER CONTROLLER MODULE INSTALLATION

1. Put the Winchester controller module in the base assembly.
2. Raise the bottom tray of the base assembly, lifting it by the front edge.
3. Install the four retaining screws.
4. Lower the bottom tray of the base assembly.
5. Install the cables to the Winchester controller module.
6. Place the main board module in the base assembly with the 64K RAM chips toward the front of the system.
7. Align the six holes in the PCB with the threaded holes in base assembly, and install the six screws that hold the main board module in place.
8. Reconnect all the I/O cables and the DC power cable.
9. Put Glyptol on the six screws that hold the main board module in place.
10. Place the top of the system back on top of the base assembly, and reinstall the front and back screws.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

HARD DISK POWER SUPPLY REMOVAL

1. Turn off the system power.
2. Disconnect the AC power cord from the AC outlet.
3. Remove the three screws on the back of the CRT/disk drive enclosure.
4. Remove the front bezel. Slip the front bezel removal tool between the top of the bezel and the top of the system, rotate the tool 90 degrees downward, and pull gently.
5. Remove the top hex slotted head screw on each side of the CRT/disk drive enclosure, and remove the top of the CRT/disk drive enclosure.
6. Remove the cables to the hard disk power supply.
7. Remove the four screws holding the power supply in place, and remove power supply.

HARD DISK POWER SUPPLY INSTALLATION

1. Place the hard disk power supply in the top half of the CRT/disk drive enclosure.
2. Align the mounting holes in the power supply with the mounting holes in the enclosure, and install the mounting screws.
3. Reconnect the cables to the power supply.
4. Place the top portion of the system back on to the base assembly.
4. Place the top of the system back on the base assembly.
5. Reconnect the CRT module I/O cable.
6. Install the three (front) and two (back) screws.
7. Place the top of the CRT/disk drive enclosure back on the system.
8. Reinstall the three back screws and the two front inside screws, and snap the front bezel back into position.

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

KEYBOARD REMOVAL

1. Turn the system power off.
2. Disconnect the AC power cord from the AC outlet.
3. Place the system so that it can be easily accessed from all sides, with at least one foot of table space immediately behind it.
4. Remove the three screws under the front edge of the system.
5. Remove the two screws on the back of the base assembly.
6. Lift up the top of the system slightly, then position it behind the base assembly with the CRT facing up.
8. Remove the six screws holding the keyboard module in place, and remove the keyboard module.

KEYBOARD INSTALLATION

1. Place the keyboard module into the keyboard module cut-out from underneath the section..
2. Install the six keyboard module retaining screws.
3. Install the keyboard module I/O cable.
4. Place the top of the system back on top of the base assembly, and reinstall the front and back screws.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

FAN REMOVAL

1. Turn off the system power.
2. Disconnect the AC power cord from the AC outlet.
3. Remove the three screws on the back of the CRT/disk drive enclosure.
4. Remove the front bezel. Slip the front bezel removal tool between the top of the bezel and the top of the system, rotate the tool 90 degrees downward, and pull gently.
5. Remove the top hex slotted head screw on each side of the CRT/disk drive enclosure, and remove the top portion of the CRT/disk drive enclosure.
6. Remove the four fan retaining screws.
7. Disconnect the AC power cable to the fan, and remove the fan.

FAN INSTALLATION

1. Reconnect the AC power cable to the fan.
2. Place the fan into the CRT/disk drive enclosure.
3. Align the fan mounting holes with the mounting holes in the enclosure, and install the four fan mounting screws.

NOTE

Reconnect the Eagle IV cables to the hard disk power supply.

4. Place the top of the system back on the base assembly.
5. Reconnect the CRT module I/O cable.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

FAN INSTALLATION (CONT'D)

6. Install the three (front) and two (back) screws.
7. Place the top of the CRT/disk drive enclosure back on the system.
8. Reinstall the three back screws and the two front inside screws, and snap the front bezel back into position.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

CRT MODULE REMOVAL

1. Turn off the system power.
2. Disconnect the AC power cord from the AC outlet.
3. Remove the three screws on the back of the CRT/disk drive enclosure.
4. Remove the front bezel. slip the front bezel removal tool in the service kit between the top of the bezel and the top of the system, rotate the tool 90 degrees downward, and pull gently.
5. Remove the top hex slotted head screw on each the CRT/Disk Drive enclosure.
6. Remove the top portion of the CRT/disk drive enclosure.

NOTE

For Eagle IV's, disconnect the cables to the hard disk power supply.

7. Disconnect the I/O cable to the CRT module PCB.
8. Place the system where it can be accessed from all sides, with at least one foot of table space immediately behind it.
9. Remove the three screws under the front edge of the system.
10. Remove the two screws on the back of the base assembly.
11. Lift up the top portion of the system slightly, then position it behind the base assembly with the CRT facing up.

4: HARDWARE MAINTENANCE

REMOVAL AND INSTALLATION PROCEDURES (CONT'D)

CRT MODULE REMOVAL (CONT'D)

12. Disconnect the power cables to the CRT module.
13. Remove the two lower and one upper hex nut holding the CRT module in place
14. Support the CRT module with one hand and remove the last hex nut holding the CRT module in place, and remove the CRT module.

CRT INSTALLATION

1. Place the CRT module into the CRT/disk drive enclosure so that the four threaded studs are inserted into the mounting holes and the CRT module faces the opening.
2. Supporting the CRT module with one hand, install one of the upper hex nuts.
3. Install the remaining hex nuts, and apply Glyptol.
4. Connect the power cables to the CRT module.

NOTE

For Eagle IV's, reconnect the cables to the hard disk power supply.

5. Place the top of the system back on the base assembly.
6. Reconnect the CRT module I/O cable.
7. Install the three (front) and two (back) screws.
8. Place the top of the CRT/disk drive enclosure back on the system.
9. Reinstall the three back screws and the two front inside screws.
10. Snap the front bezel back into position.

4: HARDWARE MAINTENANCE

CRT ADJUSTMENT PROCEDURE

The only field-adjustable module is the CRT Module. The CRT module adjustment procedures presented here are performed during the initial setup of the CRT module and whenever the video image quality deteriorates below acceptable standards. The adjustments on the CRT module must be performed in the order described.

All adjustments to the appearance of the video image are partially subjective; however, a good image should be centered, both horizontally and vertically, free of any distortion and flicker, and of a suitable brightness for operator comfort.

The following procedures apply to all adjustments on the CRT module assembly. Refer to Figure 12 for the locations of the adjustment controls.

WARNING

Portions of the monitor circuitry conduct 18,000 V. Exercise extreme caution when making any adjustment to the video circuits. Remove all metal objects such as rings, watches, and bracelets before making the adjustments. Use only the appropriate plastic or nylon adjustment tools. DO NOT USE ANY METAL

CRT ADJUSTMENT PROCEDURE (CONT'D)

1. Remove the CRT top cover, as described in the installation section of this manual.
2. Turn on the system power.
3. **24 Volt Adjustment**
 - a. Connect a digital voltmeter across ground and the case of output transistor Q101. Refer to Figure 12 CRT Adjustment Points.
 - b. Adjust the +24 volt adj. pot for an output of 24 volts \pm 0.5 volts.

NOTE

This adjustment should be performed first, because it will affect all other adjustments.

4. **Monitor Brightness**
 - a. Rotate the master brightness control on the CRT board fully counterclockwise (raster off). Refer to Figure 12.
 - b. Turn the operator brightness control knob, on the back panel fully clockwise.
 - c. Adjust the master brightness control on the CRT board until the raster just begins to appear on the CRT display, then back off slightly to the threshold of raster cutoff.
 - d. Set the desired brightness level by adjusting the operator brightness control knob on the back panel.

(CONT'D)

4: HARDWARE MAINTENANCE

CRT ADJUSTMENT PROCEDURE (CONT'D)

5. Horizontal Hold

- a. Horizontally synchronize the video image by adjusting the horizontal hold control on the CRT board until a steady image is obtained. Refer to Figure 12.

NOTE

It may be necessary to temporarily increase the raster brightness using the master brightness control, to view the edges of the raster.

- b. Center the video image horizontally by adjusting the horizontal delay control on the CRT board, until the image is properly centered. Refer to Figure 12.

6. Horizontal Image Size

- a. Adjust the horizontal image size by rotating the horizontal width coil adjustment on the CRT board. Refer to Figure 12.
- b. Rotate the coil adjustment counter-clockwise to increase image width, clockwise to decrease image width.

7. Vertical Hold

Correct video image rolling by adjusting the vertical hold control on the CRT board, until the image remains stationary.

(CONT'D)

CRT ADJUSTMENT PROCEDURE (CONT'D)

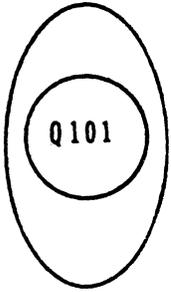
8. Vertical Image Size and Vertical Linearity

- a. Adjust the vertical size of the video image using the vertical size control on the CRT board, until the vertical video image size is 6 inches. Refer to Figure 12.
- b. Adjust the height of the test pattern characters in the top and bottom rows using the vertical linearity control on the CRT board, until the top and bottom row characters are the same height as those in the center row. Refer to Figure 12.
- c. If necessary, readjust the vertical size, described in step (a) to obtain the proper vertical image size.

9. Focus

- a. Adjust the video image focus for optimum sharpness using the focus control on the CRT board. Refer to Figure 12.
 - b. The best image sharpness is obtained at a point located near the center, and about one-third down from the top of the display.
10. Refer to **Fault Isolation** in this section to isolate problems not corrected by the adjustment procedures listed below.
 11. Inspect the interior of the CRT Module for any foreign materials when the adjustments are completed.
 12. Verify that all connectors are properly secured before replacing the top cover.

4: HARDWARE MAINTENANCE



CK 24V FIRST

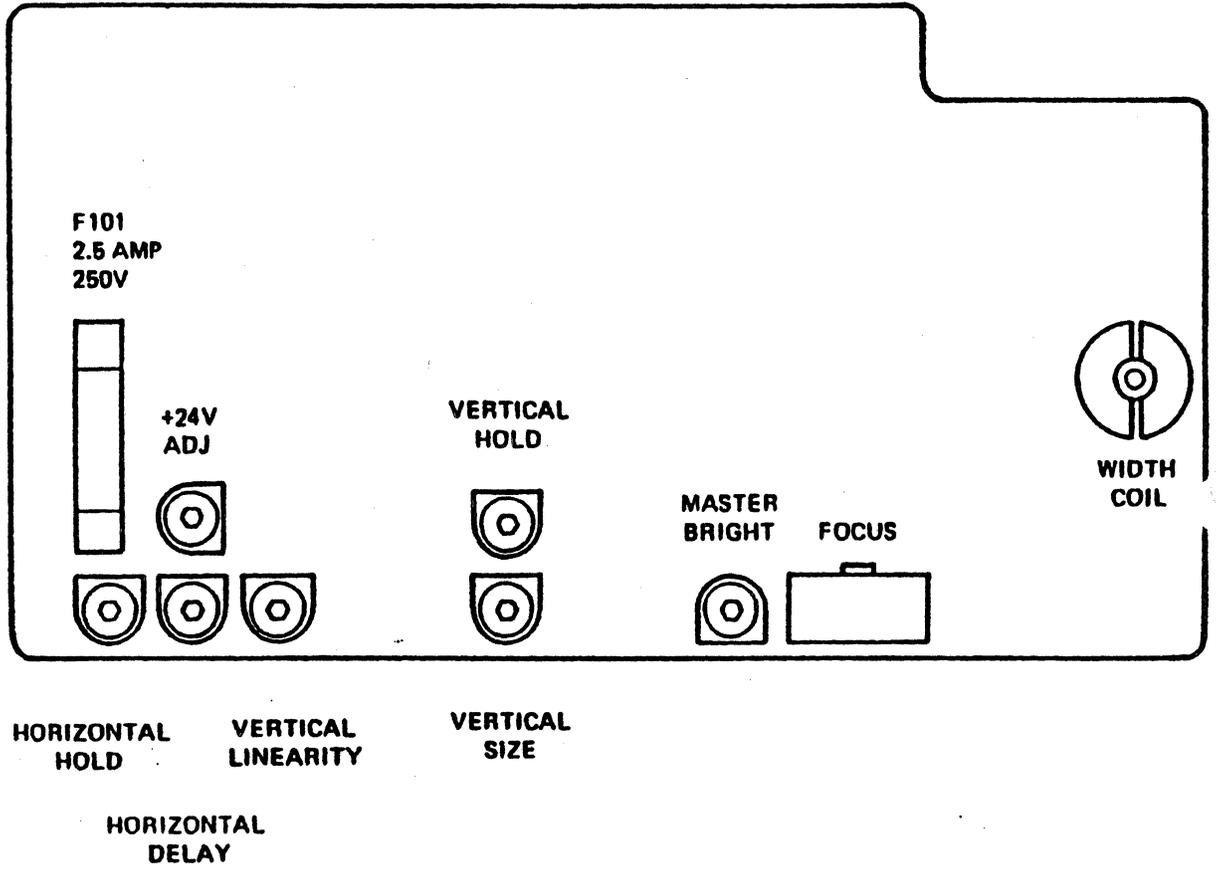


FIGURE 12: CRT ADJUSTMENT POINTS

INTRODUCTION

This section covers the following software topics:

- * Transferring files from floppy disk to hard disk.
- * Troubleshooting software problems down to these software modules:

- The Main Menu
 - The Operating System
 - Programs and Files

- * Procedures for regenerating or restoring various software modules.

5: SOFTWARE MAINTENANCE

TRANSFERRING FILES

The two methods for transferring files from floppy disk to an initialized hard disk (a hard disk with software already stored on it) are:

Transfer Eagle Software	Transfers both files and programs in one operation.
Single File Transfer	Transfers selected files one at a time.

NOTE

It is imperative that you use these procedures to transfer Eagle software. Any other means of transfer, such as the CP/M transfer program PIP, can destroy software already stored on your system.

TRANSFER EAGLE SOFTWARE

This procedure should be performed if you wish to transfer Eagle software such as Accounting Plus, Financial Planner, Word Processing, and CP/M - CBASIC.

1. Select the "Access the Utility System" option from the main menu. Once selected, the utility menu will appear.
2. Select the "Exit to the operating system" option from the utility menu. Once the selection has been made, a warning message and the CP/M "A>" will appear.
3. Type "TRANS".
4. The system will then respond by asking you which type of diskette will you be transferring from - single or double sided. If you are transferring software from a single sided diskette, such as from an Eagle II, you would select option 1; from a double sided disk, such as from an Eagle III or IV, you would select option 2.

*START HERE
TO INSTALL
FILE 10
TO BE*



(CONT'D)

TRANSFERRING FILES

**TRANSFER EAGLE SOFTWARE
(CONT'D)**

The following menu will then appear.

1. **Eagle Accounting Files**
2. **Eagle Word Processing**
3. **Eagle Financial Planner**
4. **CP/M diskette files**
5. **All other files**
6. **Return to the first menu**

5. Select the option which corresponds to the type of files you wish to transfer. You may only transfer one file type at a time.

6. When the transfer has been completed, and if you do not wish to transfer any additional files, select the "Return to the first menu" option. Two questions will subsequently appear:

Has all software been transferred?

Has the accounting software been transferred?

7. Answer the questions by typing a "Y" for yes or "N" for no. Once the questions have been answered, the system will state that the software is being initialized, and when complete will request that you press the RESET button to reboot the system.

8. Press RESET. The main menu will reappear. Any Eagle software transferred to the hard disk should now be reflected in the menu as an available option.

5: SOFTWARE MAINTENANCE

TRANSFERRING FILES (CONT'D)

SINGLE FILES TRANSFER

If you wish to transfer a single file or just a few files, then follow this procedure.

1. Select the "Access the Utility System" option from the main menu. The utility system menu will appear.
2. Select the "Transfer files" option.
3. Select the appropriate option from the new menu and follow the prompts.

NOTE

Note that this utility only allows you to transfer a single file at a time. It requires that you enter the filename of the file to transfer.

FAULT ISOLATION

This section provides a method for determining defective software modules and the cause of system failures. Once the defective software module has been identified, it should be regenerated or restored according to the procedures given in **Software Installation**.

MAIN MENU

Failure associated with the system Main Menu can appear in several two forms:

- * Incorrect main menu
- * Error message concerning HELLO.COM
- * An "A>" prompt

The first, incorrect Main Menu, occurs when the original hard disk menu has been supplanted by a floppy disk version, which usually results from "PIPing" the contents of a floppy disk to the hard disk with the CP/M wildcard character "*", as in "PIP A:=E:*.*". Since the Main Menu filenames for both systems are identical, "PIPing" in this manner overwrites the hard menu with the floppy version.

The second Main Menu failure takes the form of a screen error message, such as:

HELLO?

or just an "A>" prompt. The message is an indication the system was unable to locate the Main Menu program.

The solution to the problem is to regenerate the Main Menu program with the **Main Menu Regeneration** procedure.

5: SOFTWARE MAINTENANCE

FAULT ISOLATION (CONT'D)

OPERATING SYSTEM

Symptoms common to the failure of the operating system are as follows:

- * A screen error message.
- * The indicator light on the hard drive flickers when the system is booted, but nothing appears on the screen.

When an operating system fails, this message may appear:

System software unacceptable

This can be an indication that the system tracks were improperly written to the disk or that the system tracks were for another configuration.

The second situation, the drive indicator light flickers but nothing appears, is an indication of failed or bad system tracks; thus, the boot strap loader cannot be read.

In either case, the operating system will have to be regenerated with the **System Regeneration** procedure.

PROGRAMS AND FILES

Failures associated with a program or a file(s) can take several forms. A failed accounting data file, for example, can cause the accounting program to abort the current operation, flash a three second "ERROR EF" screen error message, and then display an unwanted program menu. A failed program, on the other hand, may not display any error message at all. Rather, it might operate in an unpredictable manner such as displaying unwanted information or responding incorrectly to input from the keyboard. In either case, the best solution is to regenerate the programs and files from your floppy backup diskettes. The procedure for this is given in **Restoring Files From Backup**.

FAULT ISOLATION (CONT'D)

**PERSISTENT HARD
DISK PROBLEMS**

You may, on occasion, encounter a problem which refuses to respond to any of the aforementioned procedures. In such a situation you may be forced to regenerate the entire hard disk. This involves formatting the disk, system regeneration, HELLO restoration, plus the restoring of all the software programs and files. The procedure for this is given under **Regeneration of the Entire Hard Disk.**

5: SOFTWARE MAINTENANCE

SOFTWARE INSTALLATION

MAIN MENU REGENERATION

To regenerate the hard disk Main Menu, use the diskette labeled **Menu Restore and System Regeneration** and follow these steps:

1. Turn on the system.
2. Insert the **Menu Restore and System Regeneration** disk into drive 'A' (top drive for an Eagle II or III).
3. Hold down the [F] key, and press the RESET button.
4. Release the [F] key when the drive indicator light on drive "A" flickers.
5. An "A>" will now appear on the screen.
6. If you have an accounting program stored on the hard disk, perform step "A". If not, perform step "B".

With an accounting program, type:

PIP A:HELLO.COM=I:HELLO.MAS[VRO]

If you make a mistake, use the [BACK SPACE] key to return to the error, and retype. When the line has been correctly entered, press [RETRN].

Without an accounting program, type:

PIP A:HELLO.COM=I:HELLO.MIN[VRO]

If you make a mistake while entering the line, use the [BACK SPACE] key to return to the error, and retype. When the line has been correctly entered, press [RETRN].

SOFTWARE INSTALLATION (CONT'D)

MAIN MENU
REGENERATION (CONT'D)

7. Wait for the "A>" prompt to reappear. The transfer is now complete.
8. Remove the diskette from the drive and press the RESET button. The appropriate hard disk Main Menu should appear.

5: SOFTWARE MAINTENANCE

SOFTWARE RESTORATION (CONT'D)

SYSTEM REGENERATION

In order to replace system tracks that have been inadvertently destroyed, use the diskette labelled **Menu Restore and System Regeneration** and follow the steps outlines below.

1. Turn on the system.
2. Insert the **Menu Restore and System Regeneration** disk into drive "A" (top drive for an Eagle II and III).
3. Hold down the [F] key and press the RESET button.
4. Release the [F] key when the drive indicator light on drive "A" flickers.
5. An "A>" prompt will appear on the screen.
6. Type "I:". If you make a mistake while entering the characters, return to the error with the [BACK SPACE] key and retype. Press the [RETURN] key.
7. The screen will respond with "I>".
8. Type "SYSGEN SYSTEM.COM" and press [RETURN].
9. A question concerning destination drive will appear. Type "A", press [RETURN].
10. The system will respond with "DESTINATION on A, then type return." Press [RETRN].
11. Wait for the system prompt to reappear; remove the diskette, and press the [RESET] button. Your hard disk system should boot up properly.

SOFTWARE INSTALLATION (CONT'D)

RESTORING FILES FROM BACKUP

This procedure should be used to restore failed hard disk files previously backed up onto floppy disk.

NOTE

The backup diskettes must have been created with the options available on the "Hard Disk Backup Menu". This menu is accessed by selecting the "Backup Your Hard Disk" option from the main menu.

1. Select the "Access the Utility System" option from the main menu. The utility menu will appear.
2. Select the "Exit to CP/M operating system" option. Once you have received the system prompt "A>", type "SETSIDE" followed with [RETURN].
3. Specify the Eagle system you are using. If your backup diskettes are single sided, select option 1; if double sided, option 2. Once the selection has been made, the system will return to the operating prompt "A>".
4. Type "HELLO", press [RETURN]. The main menu will reappear.
5. Select the "Access the Utility System" option to display the utility menu.
6. Select the "Restore Your Hard Disk Files" option. Another menu will be displayed.
7. Select "Restore All Hard Disk Files". From this point on you will be prompted to insert the backup diskettes and the system will automatically begin transferring files.

5: SOFTWARE MAINTENANCE

SOFTWARE INSTALLATION (CONT'D)

RESTORING THE ENTIRE HARD DISK

Performing this procedure will destroy the software currently stored on the hard disk. Therefore, it should only be performed as a last resort, and only after the previous procedures have been tried. This procedure requires the **Test and Initialization** disk and the **Software Master #1** disk.

1. Turn on the system.
2. Insert the **Test and Initialization** disk into drive "A" (top drive for the Eagle II and III).
3. Hold down the [F] key and press the RESET button.
4. Release the [F] key once the floppy drive indicator light flickers. Wait for the following menu to appear.

1. **Perform Hard Disk Tests.**
2. **Perform SASI - Centronics loop test.**
3. **Perform Floppy Disk Tests.**
4. **Initialize the software on Hard Disk.**
5. **Quit.**

NOTE

The functions and procedures for options 1 through 3 were previously explained in Section 4: Hardware Maintenance.

4. Select the "Initialize the software on Hard Disk" option.

(CONT'D)

SOFTWARE INSTALLATION (CONT'D)

RESTORING THE ENTIRE
HARD DISK (CONT'D)

5. A message will appear stating that the Eagle Hard Disk System is being initialized. Continue to wait for the following prompt:

**Please insert first Software Master diskette into floppy disk drive
Push any key to continue.**

6. Remove the **Test and Initialization** disk from the disk drive.
7. Insert the **Software Master #1** disk into drive "A". This disk contains all the Eagle software necessary for the hard disk system.
8. Press [RETURN]. A prompt similar to the following will appear.

**Comment Record - TRANS 9/16/82
Disk #1 - Push any key to continue.**

9. Press [RETURN].
10. The following files will be transferred:

HELLO.COM	RSTOR.COM
HELLO.MAS	COPYDOC.COM
HELLO.MIN	DISKUTIL.COM
MINI.COM	ASSIGN.COM
MASTR.COM	DISKUTIL.MAS
RECON.COM	DISKUTIL.MAS
MOVACC.COM	SETSIDE.COM
TRANS.COM	PWRDWN.COM
XBIOS.ASM	Z80.LIB
PORTID.LIB	KEYTBL.LIB

(CONT'D)

5: SOFTWARE MAINTENANCE

SOFTWARE INSTALLATION (CONT'D)

RESTORING THE ENTIRE HARD DISK (CONT'D)

11. Once the transfer operation has been completed, you will be asked if there is a second Software Master to transfer. Since there is not, answer with "No".
12. The screen will clear and the cursor will be positioned in the upper left corner of the screen.
13. Remove the **Master Diskette #1** from the drive.
14. Press the RESET button. The hard disk will boot up with the following menu:
 1. **Eagle II (Single sided)**
 2. **Eagle III (Double Sided)**
15. Select the appropriate option depending on the type of disks on which your files are stored. The following menu will then appear.
 1. **Eagle Accounting Files**
 2. **Eagle Word Processing Files**
 3. **Eagle Financial Planner Files**
 4. **CP/M diskette files**
 5. **All other files**
 6. **Return to first menu**
16. Insert a files diskette into drive "A" and select the option which corresponds to file types. Repeat this step until all the desired files have been transferred to the hard disk.
17. Once all files have been transferred, select Option 6, "Return to first menu", and answer the next two questions accordingly:

Has all software been transferred?

Has the accounting software been transferred?

(CONT'D)

SOFTWARE INSTALLATION (CONT'D)

**RESTORING THE ENTIRE
HARD DISK (CONT'D)**

18. The system will state that the software is being initialized and when complete will request that you press the RESET button to reboot the system. Once you have pressed RESET, the system should display the main menu with the proper software selections available.

NOTE

If you do not transfer any files through one of the five options, you will not be able to access the main menu upon exit.



INTRODUCTION

This section supplies part ordering information. Major assembly and subassembly part numbers are listed along with available service kits.

To order Eagle Computer parts:

Dealers - Call your distributor for parts, according to your distributors guidelines.

Distributors - Call the Eagle Computer Inc. Sales Dept. Be sure to have the Eagle model number, part number, and description ready.

6: PARTS LIST

HARDWARE ASSEMBLIES:

PART NUMBER	DESCRIPTION	MODEL
70-3056-A00	Main Board Module	Eagle I,II,III,IV
80-0060-A00	CRT Module	Eagle I,II,III,IV
67517-002	Keyboard Module	Eagle I,II,III,IV
70001-410	Disk Drive Assembly Single Sided	Eagle I,II
70001-460	Disk Drive Assembly Double Sided	Eagle III,IV
70004-541	Winchester Disk Drive 10M	Eagle IV, File 10
70004-518	Winchester Disk Dr 15.8M 15.8M	Eagle V
73041-001	Power Supply Module	Eagle I,II,III,IV
73041-002	Power Supply (linear)	Eagle IV (some models)
70000-410	Hard Disk Controller Module	Eagle IV
70-3071-A00	SASI Interface	Eagle IV, File 10
10017-001	Rear Panel 110V	Eagle I,II,III
10017-002	Rear Panel 220V	Eagle I,II,III
10017-001	Rear Panel 110V	Eagle IV
80-0062-A00	Fan Module 115V	Eagle I,II,III,IV
80-0062-A00	Fan Module 230V	Eagle I,II,III,IV

HARDWARE SUB-ASSEMBLIES:

PART NUMBER	DESCRIPTION	MODEL
52062-732	Boot PROM (Latest)	Eagle I,II,III,IV
67517-004	Keycaps (1) Set Spellbinder	Eagle I,II,III,IV
20043-088	Bottom Tray	Eagle I,II,III
20043-141	Bottom Tray	Eagle IV
20043-89	Keyboard Bezel	Eagle I,II,III,IV
20043-090	Front Bezel	Eagle II,III,IV
20043-091	CRT Bottom	Eagle I,II,III,IV
20043-092	CRT Top	Eagle I,II,III
20043-156	CRT Top	Eagle IV
20043-190	Front Bezel	Eagle I
71019-001	Sunflex 12" Filter	Eagle III,III,IV

CABLES

PART NUMBER	DESCRIPTION	MODEL
67-0112-A00	Cable PIO "A" to PCB	Eagle I,II,III
67-0010-A00	Cable PIO "B" to PCB	Eagle I,II,III
67-0013-A00	Cable SIO "A" to PCB	Eagle I,II,III
67-0030-A00	Cable SIO "B" to PCB	Eagle I,II,III
67-0011-A00	Cable Disk Drive to PCB	Eagle I,II,III
67-0029-A00	Cable from Keyboard to PCB	Eagle I,II,III,IV
67-0121-A00	Cable Disk Drive to Power Supply	Eagle I,II,III
67-0121-A00	Cable Disk Drive to Power Supply	Eagle IV
67-1912-A00	Serial A-B Test Cable	
67-1911-A00	Parallel A-B Test Cable	

DISKETTES AND DIAGNOSTIC PROGRAMS

PART NUMBER	DESCRIPTION
70002-004	Single-Sided, Double-Density Diskette
70002-003	Double-Sided, Double-Density Diskette
62-0467-A00	Floppy Disk Drive Diagnostic Test
62-0466-A00	Hard Disk Test/Initialization
62-0469-A00	Software Master #1

TOUCH UP PAINT

PART NUMBER	DESCRIPTION	MODEL
96-0066-A00	Grey Touch Up Paint	Eagle I-IV, File 10
96-0067-A00	Black Touch Up Paint	Eagle I-IV, File 10

6: PARTS LIST

SERVICE KITS

PART NUMBER	DESCRIPTION	MODEL
93-1901-A00	Service Kit	Eagle I,II

Includes:

- (1) 1-CRT Module
- (2) 1-Disk Drive Assy Single-Sided
- (3) 1-Muffin Fan 115V
- (4) 1-Power Supply Module
- (5) 1-Keyboard Module
- (6) 1-Main Board Module
- (7) 1-Motorola Service Manual
- (8) 1-Parallel A-B Test Cable
- (9) 1-Serial A-B Test Cable
- (10) 1-Diagnostic Test Diskette
- (11) 2-Blank Diskettes
- (12) 1-Hardware Set, misc., nuts, bolts, washers
- (13) 1-Manual, Eagle Service
- (14) 1-Tool Kit (7 pieces)

- 1-MT-Monitor Tweaker
- 1-Phillips Screwdriver
- 1-T601-4 Standard Screwdriver
- 1-T630-1/4 Nut Driver
- 1-T630-5/16 Nut Driver
- 1-T-5/16 x 1/4 Open End Wrench
- 1-20-43-107A Bezel Remover

93-1902-A00	Service Kit 115V	Eagle III
--------------------	-------------------------	------------------

Includes: (Eagle II Kit with Double-Sided, Double-Density Drive)

62-0468-A00	Diagnostic Kit	Eagle IV
--------------------	-----------------------	-----------------

Includes:

- SASI loopback Cable
- Software Master #1 Disk
- Hard Disk Test and Initialization Disk

SERVICE KITS (CONT'D)

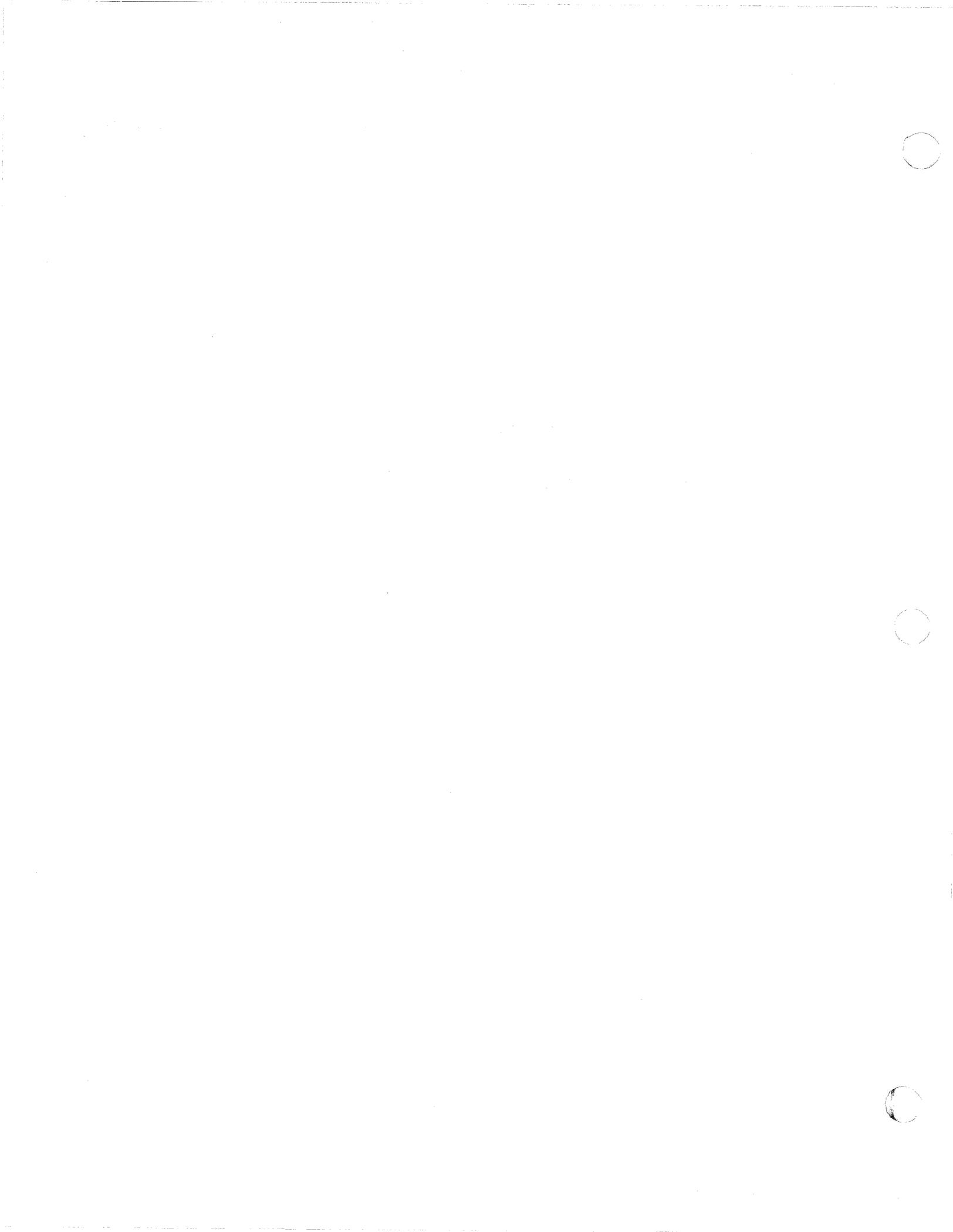
PART NUMBER	DESCRIPTION	MODEL
96-3011-A00	Service Kit	Eagle IV
Includes:	SASI Loopback Cable Software Master #1 Disk Hard Disk Test and Initialization Disk 1-Winchester Disk Drive 10M P/N 7000-410 1-Hard Disk Controller Module P/N 70000-410 1-SASI Interface Module P/N 10018-003	
93-1204-A00	Service Kit	Eagle I,II,III,IV File 10
	Full Contents of Eagle II Service Kit Full Contents of Eagle IV Kit 1-460 Disk Drive	
93-1903-A00	Service Kit	Eagle II
Includes:	Eagle II to IV Upgrade Kit	
67-1913-A00	Service Kit	Eagle I,II,III,IV, File 10
Includes:	Tool Kit	
10021-001	Service Kit	Eagle I,II,III,IV, File 10
Includes:	Spellbinder Kit-Manual, Diskettes,Keycaps,Puller	
70003-031	Service Kit	Eagle I,II,III,IV
Includes:	Motorola Service Manual	

6: PARTS LIST

TOOLS

PART NUMBER	DESCRIPTION	MODEL
20043-107	Bezel Remover	Eagle I,II,III,IV,
64003-002	Keycap Puller	Eagle I,II,III,IV

Appendix A: Communication Ports
Appendix B: Technical Specifications
Appendix C: BIOS Documentation
Appendix D: EPROM Error Messages
Appendix E: Schematics



A: COMMUNICATION PORTS

PORT PINOUTS

SERIAL A: Eagle I, II, III, IV.

PIN # - SIGNAL NAME

1 - FG
2 - RD
3 - TD
4 - RTS
5 - CTS
6 - NC
7 - SG
8 - NC
9 - NC
10 - NC
11 - NC
12 - NC
13 - NC
14 - NC
15 - NC
16 - NC
17 - NC
18 - NC
19 - NC
20 - NC
21 - NC
22 - NC
23 - NC
24 - NC
25 - NC

SERIAL B: Eagle I, II, III, IV

PIN # - SIGNAL NAME

1 - FG
2 - RD
3 - TD
4 - RTS
5 - CTS
6 - NC
7 - SG
8 - NC
9 - NC
10 - NC
11 - NC
12 - NC
13 - NC
14 - NC
15 - NC
16 - NC
17 - NC
18 - NC
19 - NC
20 - NC
21 - NC
22 - NC
23 - NC
24 - NC
25 - NC

NOTE

Both serial ports are asynchronous.

A: COMMUNICATION PORTS

PORT PINOUTS (CONT'D)

PARALLEL A: Eagle I, II, III

PIN # - SIGNAL Name

1 - NC
2 - NC
3 - NC
4 - NC
5 - NC
6 - GND
7 - NC
8 - GND
9 - BUS DIR
10 - GND
11 - NC
12 - DRIVE ACK
13 - NC
14 - NC
15 - NC
16 - COMPLETE
17 - GND
18 - NC
19 - HDD6
20 - HDD7
21 - HDD4
22 - HDD5
23 - HDD2
24 - HDD3
25 - HDD0
26 - HDD1
27 - READY
28 - GND
29 - STROBE
30 - GND
31 - HDREST
32 - GND
33 - NC
34 - NC

**PARALLEL B: Eagle I, II, III
PARALLEL PRINTER PORT: Eagle IV**

PIN # - SIGNAL NAME

1 - DATA STB
2 - DATA 1
3 - DATA 2
4 - DATA 3
5 - DATA 4
6 - DATA 5
7 - DATA 6
8 - DATA 7
9 - DATA 8
10 - NC
11 - BUSY
12 - NC
13 - ON LINE
14 - NC
15 - NC
16 - SIGNAL GND
17 - NC
18 - NC
19 - GND
20 - GND
21 - GND
22 - GND
23 - GND
24 - GND
25 - GND
26 - GND
27 - GND
28 - NC
29 - GND
30 - GND
31 - NC
32 - NC
33 - GND
34 - NC
35 - NC
36 - NC

A: COMMUNICATION PORTS

PORT PINOUTS (CONT'D)

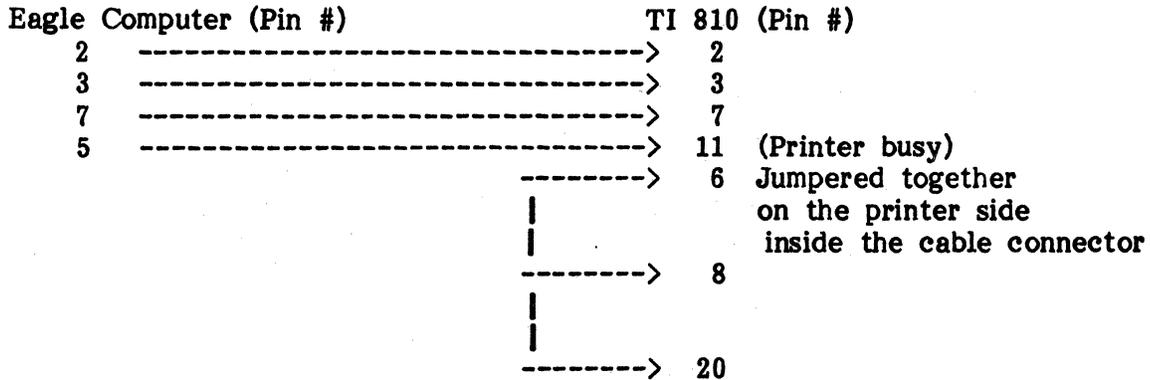
SYSTEM INTERFACE PORT: Eagle IV

Signal Pin	Ground Return	Signal Name
2	1	DATA0-
4	3	DATA1-
6	5	DATA2-
8	7	DATA3-
10	9	DATA4-
12	11	DATA5-
14	13	DATA6-
16	15	DATA7-
18	17	Spare
20	19	Spare
22	21	Spare
24	23	Spare
26	25	Spare
28	27	Spare
30	29	Spare
32	31	Spare
34	33	Spare
36	35	BUSY-
38	37	ACK-
40	39	RST-
42	41	MSG-
44	43	SEL-
46	45	C-/D
48	47	REQ-
50	49	I-/O

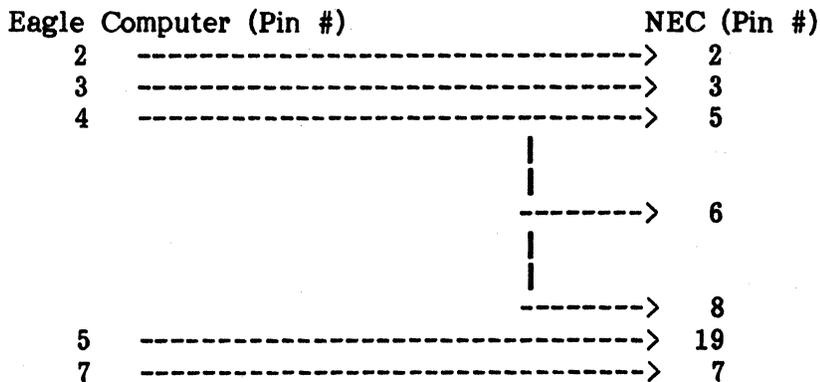
A: COMMUNICATION PORTS

CABLE DIAGRAMS

1. TI 810 Dot Matrix Printer (150 characters per second)

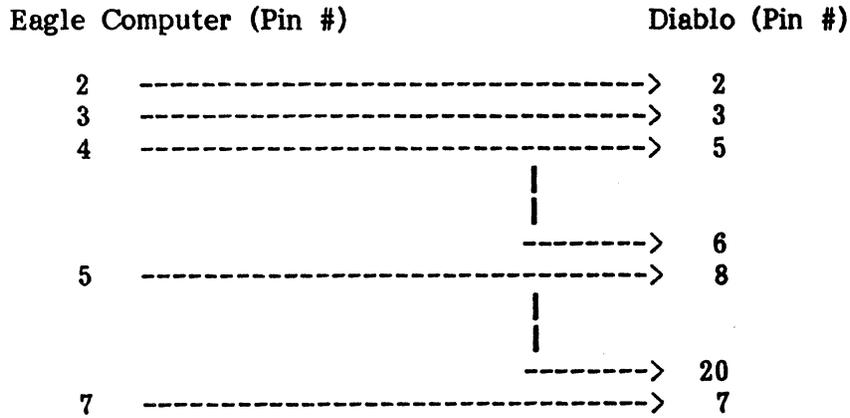


2. NEC 5515 Letter Quality Printer (55 characters per second). NEC 7715 Letter Quality Printer (55 characters per second).

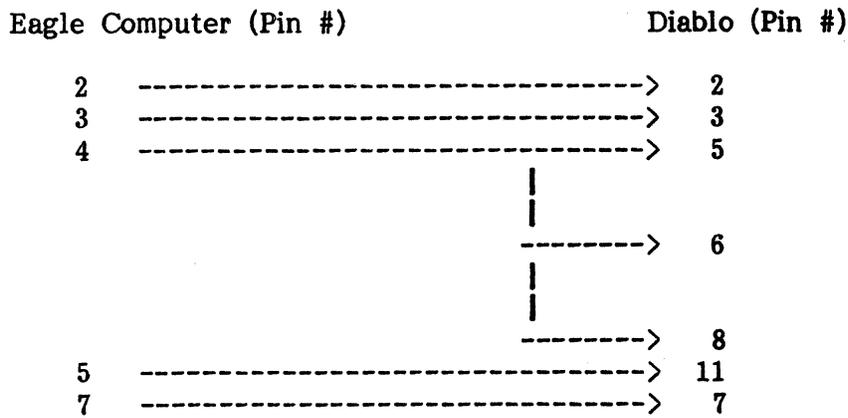


CABLE DIAGRAMS (CONT'D)

3. Diablo 1650 Letter Quality Printer (55 characters per second)



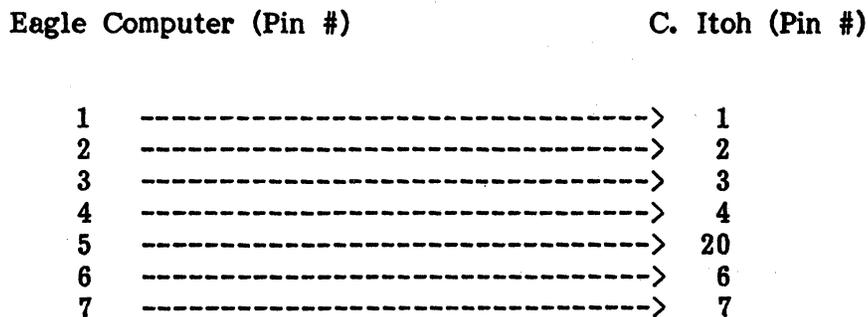
4. Diablo 630



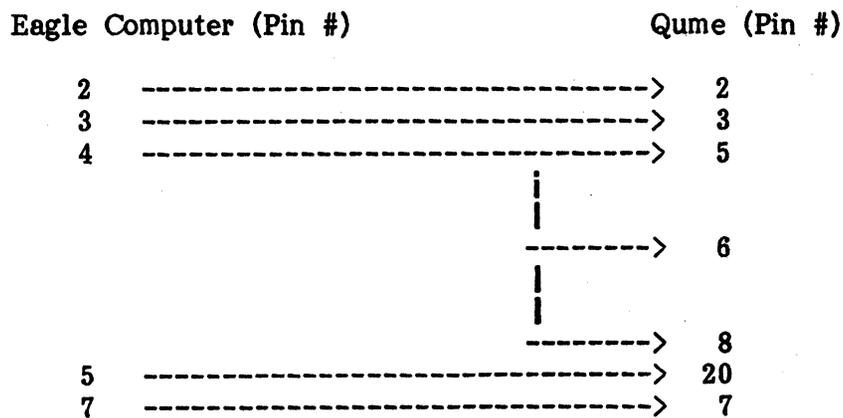
A: COMMUNICATION PORTS

CABLE DIAGRAMS (CONT'D)

5. C.Itoh Dot Matrix Printer Model 8300R (100 characters per second)



6. Qume Sprint 5 Letter Quality Printer (55 characters per second)

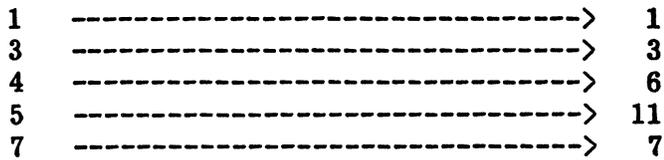


CABLE DIAGRAMS (CONT'D)

7. Microline 82A, 83A

Eagle Computer (Pin #)

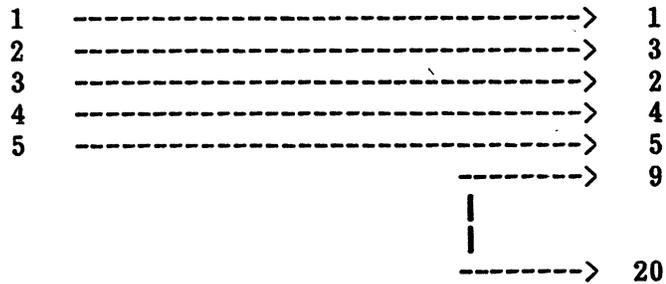
Microline (Pin #)



8. Bell 103A Modem Interface

Eagle Computer (Pin #)

Bell Modem



B: TECHNICAL SPECIFICATIONS

SYSTEM

Temperature Range(Operating)	50o-95o F
Temperature Range(Non-Operating)	-40o-140o F
Relative Humidity(Operating)	20%-80% Non-condensing
Relative Humidity(Non-Operating)	1%-95% Non-condensing
Maximum Altitude	8,000 feet ASL
Voltage Requirements	
110 VAC	95 VAC - 135 VAC, 60 Hz,
220 VAC	205 VAC - 235 VAC, 50 Hz

CRT MODULE

Video Performance

Resolution	1,200 lines (center), 950 lines at corners
Bandwidth	10 Hz to 3 MHz (typical)
Focus	Dynamic focus, adjustable voltage to CRT focus element

Synchronization

Horizontal	18.5 KHz, +/- 500 Hz
Vertical	47 - 63 Hz
Horizontal Blanking	10 us, min. @ 18.5 KHz
Vertical Blanking	800 us (includes retrace and video delay)

(CONT'D)

B: TECHNICAL SPECIFICATIONS

CRT MODULE (CONT'D)

Video Performance (Cont'd)

Input signals

Horizontal 4 to 32 us; input TTL compatible, positive-going 4 volts peak-to-peak, +/-1.5 volts.

Vertical 50 to 1,400 us; input TTL compatible, positive-going 4 volts peak-to-peak, +/-1.5 volts.

Video Positive white, input termination 470 ohms, +/-5%; 2.5 to 5.0 volts peak-to-peak.

Image Distortion Horizontal distortion less than 1 % of vertical dimension. Vertical distortion less than 1 % of horizontal dimension.

Linearity Character height and width does not exceed +/- 7% of average character size. Adjacent characters will not vary more than 5%.

Heat dissipation 314 BTU/hr. max

B: TECHNICAL SPECIFICATIONS

DISK DRIVE MODULE

Floppy Disk Drives

SINGLE SIDED (410) DOUBLE SIDED (460)

Capacity (formatted)		
Per Disk	390 KBytes	780 KBytes
Per Side	390 KBytes	390 KBytes
Per Track	5120 Bytes	5120 Bytes
Per Sector	1024 Bytes	1024 Bytes
Per Track	5	5
Tracks Per Side	80	80
Track Density	96 tpi	96 tpi
R/W Heads	1	2
Index	1	1
Encoding Method	MFMM	MFMM
Rotational Speed	300 RPM	300 RPM
Transfer Rate	250 Kbits/sec	250 kbits/sec
Latency(avg.)	100 msec	100 msec
Access Time(w/o settling)		
Track to Track	6 msec	6 msec
Side to Side	-----	0.2 msec
Average	158 msec	158 msec
Settling Time	15 msec	15 msec
Motor Start Time	200 msec	200 msec
Power Requirements		
	+5 volts DC +/- 5%, 1.3 amps(typical) 2.2 amps(max)	
	+12 volts DC +/- 5%	

B: TECHNICAL SPECIFICATIONS

DISK DRIVE MODULE (CONT'D)

Winchester Disk Drives (Model IV)

Capacity (formatted)	
Per Drive	10 Mbytes
Per Side	2.5 Mbytes
Per Track	8.2 Kbytes
Per Sector	516 Bytes
Sectors Per Track	16
Tracks Per Side	306
Track Density	345 tpi
R/W Heads	4
Disks	2
Index	1
Encoding Method	MFM
Rotational Speed	3600 RPM
Transfer Rate	5.0 Mbits/sec
Latency(avg.)	8.33 msec
Access Time	
Track to Track	2 msec
Average	80 msec
Settling Time	13 msec
Power Requirements	
+5 volts DC +/- 5%	
+12 volts DC +/- 5%	

MAIN BOARD MODULE

Power requirements	
+5.0 volts DC +/- 5%	
+12.0 volts DC +/- 5%	
-12.0 volts DC +/- 5%	

WINCHESTER CONTROLLER MODULE

Power requirements	
+5.0 volts DC +/- 5%, 2.5 Amp.(Max),2.0 Amp.(Typical)	
+12.0 volts DC +/- 10%, 66.0 Ma.(Max), 48.0 Ma.(Typical)	

KEYBOARD MODULE

Mechanical type key switches
No on-board electronics

INTRODUCTION

The purpose of this document is to provide the technician or user with pertinent technical information about the CP/M BIOS (basic input/output system) for the Eagle Computer line. The BIOS contains all of the Operating System programming in CP/M that is machine dependent. It also contains all of the input/output programs for the console device (keyboard and CRT), the disk controller interface, and the list device (printer ports). The list and logical devices are shipped with the configurations shown in Tables 7 and 8.

NOTE

This information is only for those users who expect to write their own programs which are hardware dependent, and is not necessary for normal operation of most standard software.

C: BIOS DOCUMENTATION

TABLE 7: VALUE ASSIGNMENTS

FIELD	0	1	2	3
CON: (Console)	TTY:	CRT:	BAT:	UC1:
RDR: (Reader)	TTY:	PTR:	UR1:	UR2:
PUN: (Punch)	TTY:	PTP:	UP1:	UP2:
LST: (List)	TTY:	CRT:	LPT:	UL1:

TABLE 8: LOGICAL DEVICES

INPUT	OUTPUT
TTY:	Serial Port A (Teletype)
CRT:	Keyboard (Cathode Ray Tube)
BAT:	Reader (Batch)
UC1:	Serial Port B (User Console #1)
PTR:	Keyboard (Paper Tape Reader)
UR1:	Serial Port A (User Reader #1)
UR2:	Serial Port B (User Reader #2)
PTP:	Serial Port B (Paper Tape Punch)
UP1:	N/A (User Punch #1)
UP2:	N/A (User Punch #2)
LPT:	N/A (Line Printer)
UL1:	N/A (User Line Printer)

GENERAL INFORMATION

The Eagle II and the Eagle III are comprised of the following elements:

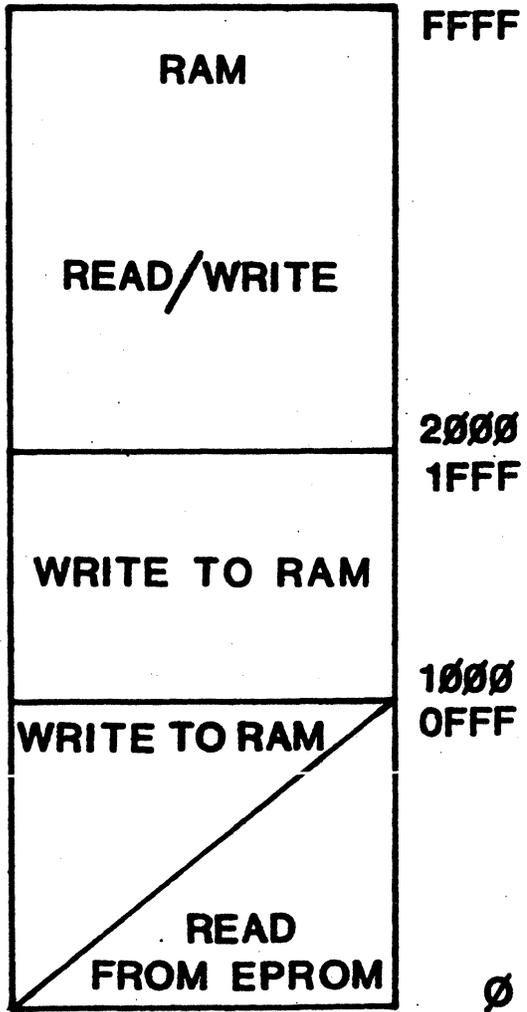
- * Z80A processor (4 Mhz)
- * Z80 DMA controller
- * Two Z80 PIO parallel port I/O controllers
- * SMC CRT5037 CRT controller
- * SMC 8002 character generator
- * Z80 CTC counter/timing controller
- * Z80 DART dual asynchronous serial port I/O controller
- * KR-3600 keyboard controller
- * NEC 765 floppy disk controller
- * 4K of EPROM
- * 64K of RAM
- * Miscellaneous registers and interface logic

CPU AND MEMORY

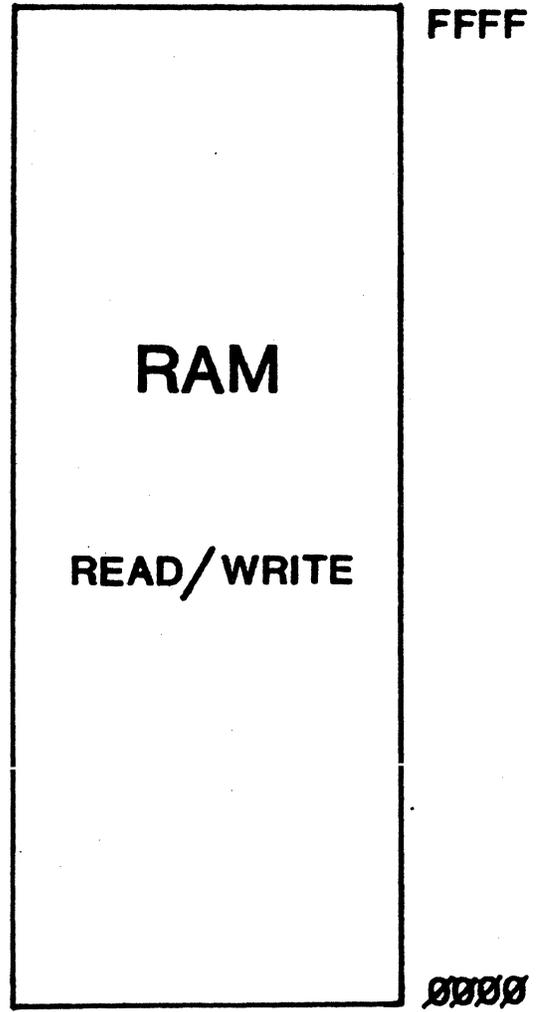
The RAM is composed of 8 64K x 1 dynamic RAM memory chips.

The Z80 has the capability to address (READ from or WRITE to) 64K bytes of memory. When the system is first powered up the processor reads from memory beginning at location 0000H. The memory and EPROM are configured in such a way that when the processor reads from memory, the EPROM occupies memory from 0000H to 1000H and RAM from there to the limit of memory, FFFFH. When the processor is performing a WRITE, the entire memory from 0000H through FFFFH is occupied by RAM.

After the disk boot program is loaded into RAM from the EPROM, bit #7 of port 34H is set, which disables the ability to read from the EPROM, effectively removing it and enables the ability to read from RAM locations 0-1000H which were previously EPROM read-mapped. (See Figure 13.)



POWER UP



AFTER INITIALIZATION

FIGURE 13: MEMORY MAP

SYSTEMS ADDRESSES

For an overview to the Input/Output ports, see Figure 14.

KEYBOARD

The KR3600 chip scans the X/Y matrix of switches and produces a 7 bit code which can be read at port 36H on bits 0 through 6. Whenever the depression of a key is sensed, a flag is set at bit #7 of port 35H, and is reset when port 36H is read. The information for the alpha lock is found at port 35H, bit #6, the control key status is on bit #1, and the shift key status is found on bit #0. All are true when = 1. The beeper is controlled by setting bit #6 at port 34H for an appropriate length of time and then cleared. (See Figure 15.)

VIDEO DISPLAY

A register at port 31H holds the cursor column position in bits 0 through 6, and a register at port 32H holds the cursor line number in bits 0 through 5. The bits in these registers are used to address the 80*24 video buffer. READY is located at port 30H, bit 7. When this bit flag is set true a byte of data may be written here. At port 33H is the register which is used to write data into the video buffer.

The video controller chip is an SMC CRT5037 and occupies a 16 byte port block which begins at port 80H. (See Figure 16.)

PARALLEL PRINTER PORTS

The parallel ports are implemented with 2 Z80A-PIO's, and occupy four (4) ports beginning at port 08H. Each PIO chip contains two ports, A and B. Port A on each PIO is used to output/input data, while port B handles the strobing and status.

Parallel Port A (Port 2 in the BIOS) is a bidirectional parallel data port which is used for connection of external hard disk drives such as the FILE-10.

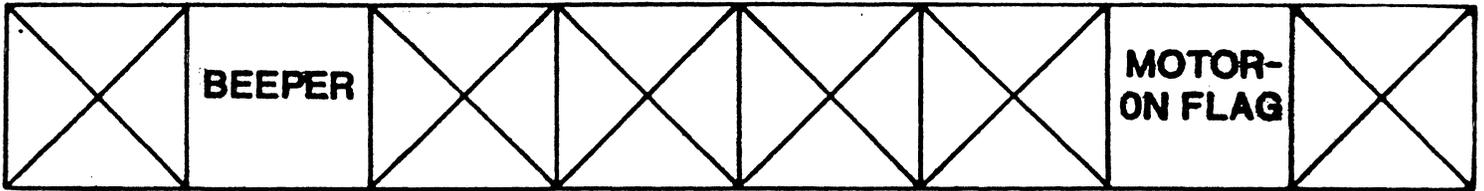
Parallel Port B (Port 1 in the BIOS) is a Centronics compatible printer port (output only) with 8 parallel data lines and several control lines. Strobe is on bit 1, busy is found on bit 2, paper out is on bit 3, online is on bit 4, and fault is on bit 5. (See Figure 17. See also Figure 18, reprinted with permission from the 1982/83 Data Book, edited and published by Zilog, Inc.)

C: BIOS DOCUMENTATION

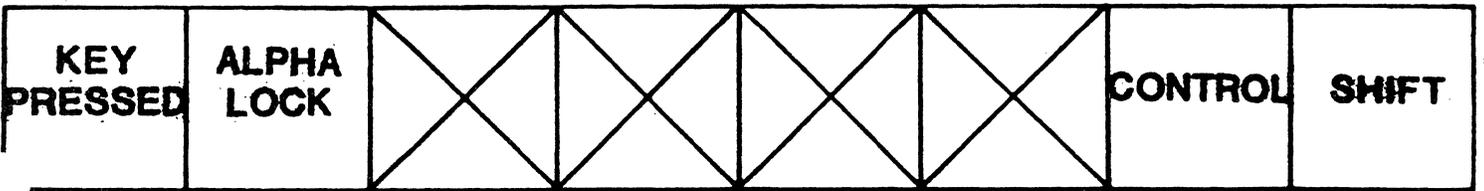
	FF
	90
VIDEO	8F
	80
	7E
	75
KEYBOARD DATA	37
KEYBOARD STATUS	36
	35
	34
VIDEO DATA	33
BUFFER LINE #	32
BUFFER COL. #	31
VIDEO STATUS	30
	2F
	2A
FLOPPY DISK CONTROLLER	29
	28
	27
	26
	25
DMA	24
	23
	22
SERIAL PORTS	1C
	1B
	18
	17
	14
HARD DISK ADP.	13
	12
	11
PARALLEL PORTS	0C
	0B
	0A
	09
	08
CTC	4
	3
	2
	1
	0

FIGURE 14: I/O PORT MAP

34:



35:



36:

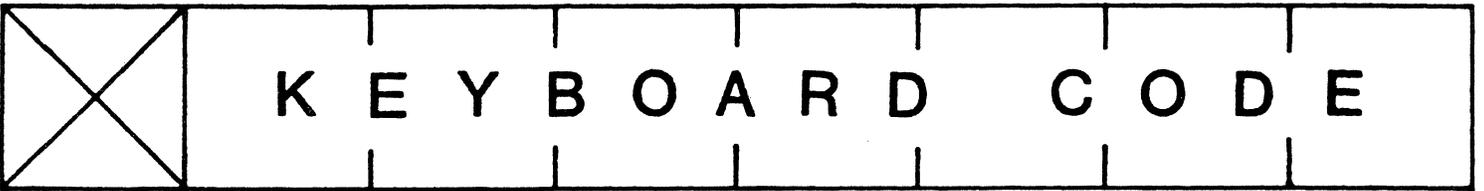


FIGURE 15: KEYBOARD

C: BIOS DOCUMENTATION

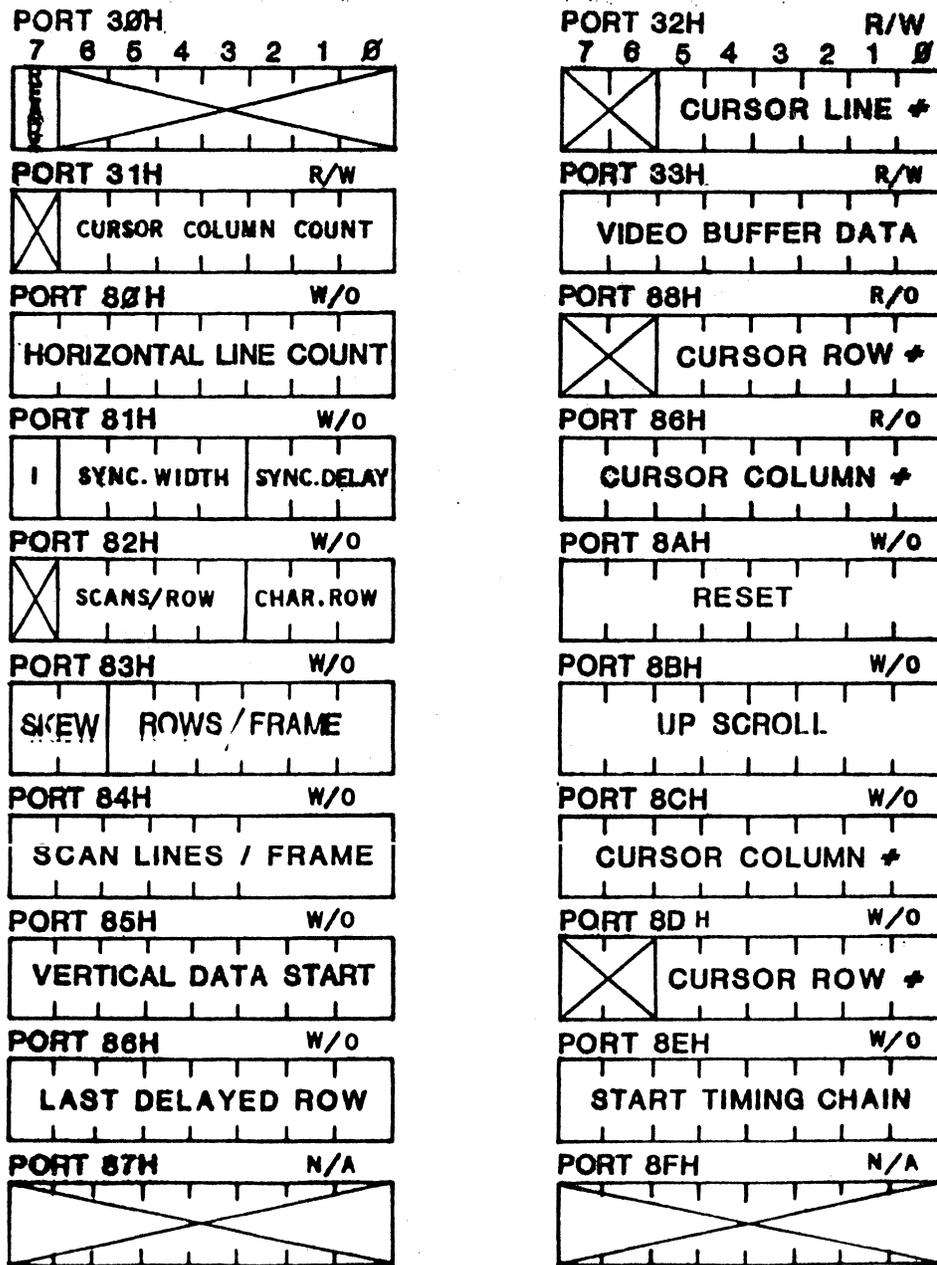


FIGURE 16: VIDEO DISPLAY REGISTER

C: BIOS DOCUMENTATION

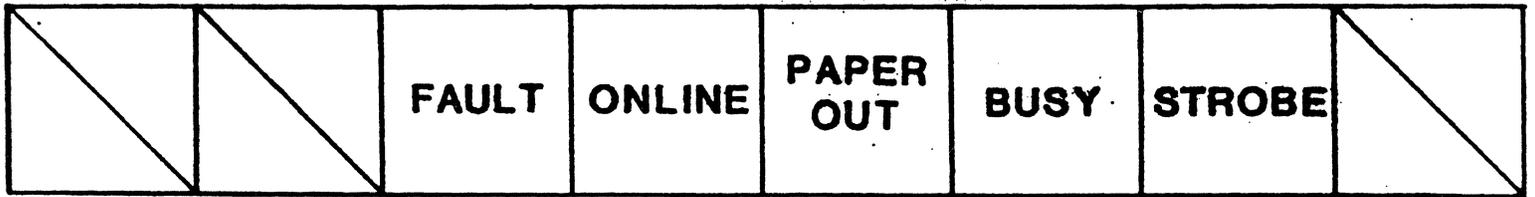


FIGURE 17: PARALLEL PORT

C: BIOS DOCUMENTATION

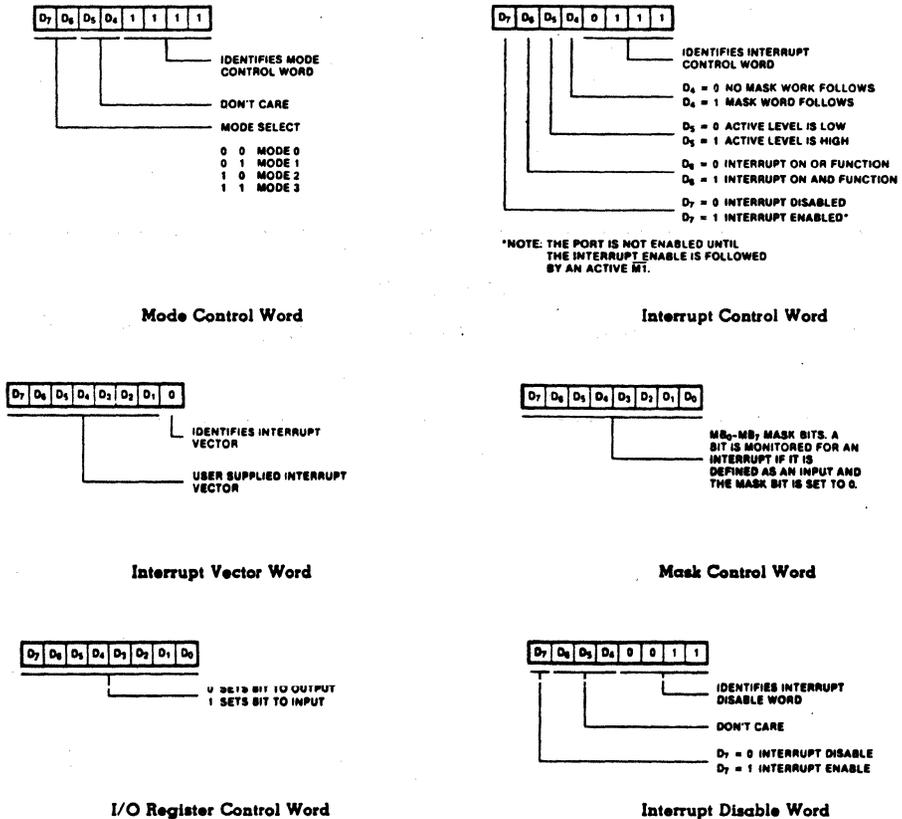


FIGURE 18: PORT WORDS

**PARALLEL PRINTER PORTS
(CONT'D)**

PROGRAMMING

Mode 0, 1, or 2. (Byte Input, Output, or Bidirectional). Programming a port for Mode 0, 1, 2 requires two words per port. These words are:

A Mode Control Word: Selects the port operating mode. This word may be written any time.

An Interrupt Vector: The Z-80 PIO is designed for use with the Z-80 CPU in interrupt Mode 2. When interrupts are enabled, the PIO must provide an interrupt vector.

Mode 3. (Bit Input/Output) Programming a port for Mode 3 operation requires a control word, a vector, (if interrupts are enabled), and three additional words, described as follows:

I/O Register Control: When Mode 3 is selected, the mode control word must be followed by another control word that sets the I/O control register, which in turn defines which port lines are input and which are output.

Interrupt Control Word: In Mode 3, handshake is not used. Interrupts are generated as a logic functions of the input signal levels. The interrupt control word sets the logic conditions and the logic levels required for generating an interrupt. Two logic conditions or functions are available:

AND (if all input bits change to the active level, an interrupt is triggered).

OR (if any one of the input bits change to the active level, an interrupt is triggered)
Bit D₆ sets the logic function. The active level of the input bits can be set either High or Low. The active level is controlled by Bit D₅.

C: BIOS DOCUMENTATION

PARALLEL PRINTER PORTS (CONT'D)

PROGRAMMING

Mark Control Word. This word sets the mask control register, allowing any unused bits to be masked off. If any bits are to be masked, than D_4 must be set. When D_4 is set, the next word written to the port must be a mask control word. (See Figure 19.)

Interrupt Disable. There is one other control word which can be used to enable or disable a port interrupt. it can be used without changing the rest of the interrupt control word.

SERIAL PORTS/CTC

The serial ports utilize a Z80A-DART which occupies four (4) ports. For Serial A the data port is 18H and the status bit port is 19H. For Serial B the data port is 1AH and the status bit port is 1BH.

PROGRAMMING

To program the Z-80 DART, the system program first issues a series of commands that initialize the basic mode and then other commands that qualify conditions within the selected mode. For example, the character length, clock rate, number of stop bits, even or odd parity are first set, then the Interrupt mode and, finally, receiver or transmitter enable.

Both channels contain command registers that must be programmed via the system program prior to operation. The Channel Select input (B/A) and the Control/Data input (C/D) are the command structure addressing controls, and are normally controlled by the CPU address bus.

Write Registers. The Z-80 DART contains six registers (WR0-WR5) in each channel that are programmed separately by the system program to configure the functional personality of the channel. (Refer to Table 9 for the individual write register functions.) With the exception of WR0, programming the write registers requires two bytes. The first byte contain three bits (D_0 - D_2) that point to the selected register; the second byte is the actual control word that is written into the register to configure the Z-80 DART.

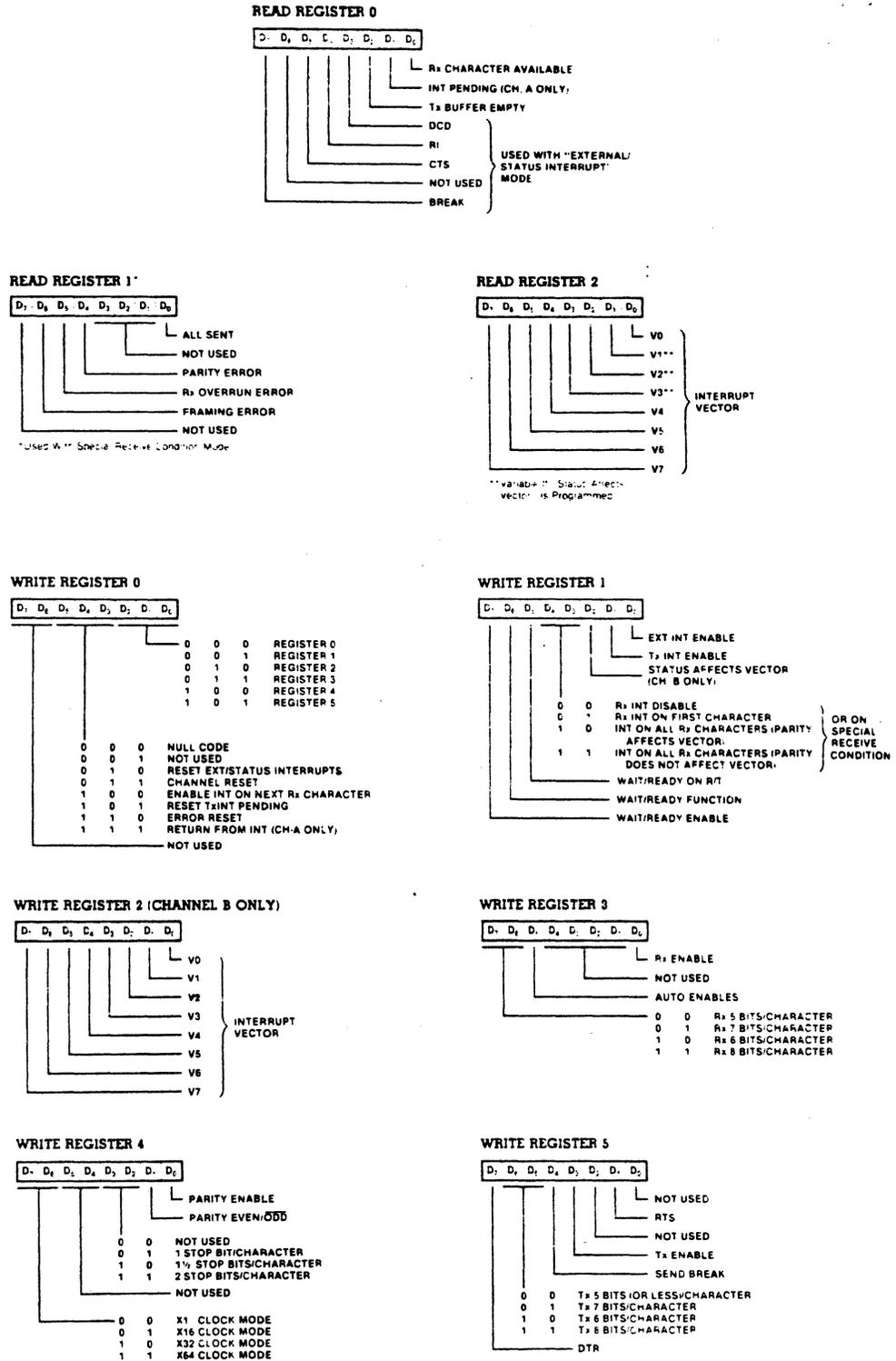


FIGURE 19: READ AND WRITE REGISTERS

C: BIOS DOCUMENTATION

SERIAL PORTS/CTC (CONT'D)

PROGRAMMING (CONT'D)

WR0 is a special case in that all the basic commands (CMD₀-CMD₂) can be accessed with a single byte. Reset (internal or external) initializes the pointer bits D₀-D₂ to point to WR0. This means that a register cannot be pointed to the same operation as a channel reset.

TABLE 9: WRITE REGISTER FUNCTIONS

REGISTER	FUNCTION
WR0	Registers pointers, initializes commands for the various modes, etc.
WR1	Transmit/Receive interrupt and data transfer mode definition.
WR2	Interrupt vector (Channel B only).
WR3	Receive parameters and control.
WR4	Transmit/Receive miscellaneous parameters and modes.
WR5	Transmit parameters and controls.

Read Registers. The Z-80 DART contains three registers (RR0-RR2) that can be read to obtain the status information for each channel (except for RR2, which applies to Channel B only). The status information includes error conditions, interrupt vector and standard communications-interface signals. (Refer to Table 10 for the individual read register functions.)

To read the contents of a selected read register other than RR0, the system program must first write the pointer byte to WR0 in exactly the same way as a write register operation. Then, by executing an input instruction, the contents of the addressed read register can be read by the CPU.

**SERIAL PORTS/CTC
(CONT'D)**

**PROGRAMMING
(CONT'D)**

The status bits RR0 and RR1 are carefully grouped to simplify monitoring. For example, when the interrupt vector indicates that a Special Receive Condition interrupt has occurred, all the appropriate error bits can be read from a single register (RR1).

TABLE 10: READ REGISTER FUNCTIONS

REGISTER	FUNCTION
RR0	Transmit/Receive buffer status, interrupt status, and external status.
RR1	Special Receive Special status.
RR2	Modified interrupt vector (Channel B only).

CTC

A Zilog Z80A-CTC (counter timer/controller) is used to time the bit rates for the serial ports. The CTC occupies four (4) ports beginning at 00H. The CTC times the bit (baud) rate for serial port A using channel 1, while channel 2 times serial port B. Channel 0 is used for the Real Time Clock and channel 3 is used for the disk interrupt.

Features of the CTC Counter/Timer Circuit include:

- * Four independent programmable counter/timer channels, each with a readable downcounter and a selectable 16 or 256 prescaler. Downcounters are reloaded automatically at zero count.
- * Three channels have Zero Count/Timeout outputs capable of driving Darlington transistors.
- * Selectable positive or negative trigger initiates timer operation.
- * Standard Z-80 Family daisy-chain interrupt structure provides fully vectored, prioritized interrupts without external logic. The CTC may also be used as an interrupt controller.

C: BIOS DOCUMENTATION

SERIAL PORTS/CTC (CONT'D)

CTC (Cont'd)

- * Interface directly to the Z-80 CPU or - for baud rate generation - to the Z-80 DART.

The Z-80 CTC four-channel counter/timer can be programmed by system software for a broad range of counting and timing applications. The four independently programmable channels of the Z-80 CTC satisfy common microcomputer system requirements for event counting, interrupt and interval timing, and general clock rate generation.

System design is simplified because the CTC connects directly to both the Z-80 CPU and the Z-80 DART with no additional logic. In larger systems, address decodes and buffers may be required.

Programming the CTC is straightforward: each channel is programmed with two bytes; a third is necessary when interrupts are enabled. Once started, the CTC counts down, reloads its time constant automatically, and resumes counting. Software timing loops are completely eliminated. Interrupt processing is simplified because only one vector need be specified; the CTC internally generates a unique vector for each channel.

The Z-80 CTC requires a single +5V power supply and the standard Z-80 single-phase system clock. It is fabricated with n-channel silicon-gate depletion-load technology, and packaged in a 28-pin plastic or ceramic DIP.

DISK CONTROLLER CHIP

The Eagle uses a 765 disk controller chip manufactured by NEC which is capable of controlling two single or double sided 5 1/4 inch floppy disks. Data transfer is controlled by DMA.

DISK FORMAT

The sector format of the diskettes used in Eagles is 80 tracks per side, 5 sectors per track, 1024 bytes per sector and the recording format is MFM. This format pertains to both single and double-sided diskettes. On a typical single-sided diskette the first two tracks on the diskette, tracks 0 and 1, are reserved for the operating system. The remaining 78 tracks are available for program, directory and data storage. The formatted capacity of a single-sided diskette is approximately 400 kilobytes and the formatted capacity of a double-sided diskette is approximately 800 kilobytes.

The capability is built into the BIOS to allow reading of either single or double sided diskettes. The actual technique involves referring to the various different formats by means of different drive designators. For example, an Eagle III with its two double-sided disk drives which has had a double-sided operating system booted into it, accesses double-sided diskettes in the top and bottom drives as A and B respectively. Single-sided diskettes could then be inserted into the top and bottom drives and accessed as I and J respectively.

If the same Eagle III with its two double-sided disk drives has had a single-sided operating system booted into it, single-sided diskettes in the top and bottom drives are accessed as A and B respectively. Double-sided diskettes could then be inserted into the top and bottom drives and accessed as I and J respectively.

This capability allows easy transfer of data from one format to another by the use of a CP/M utility, such as PIP. For example, if an Eagle III has a double-sided operating system booted into it and you wished to transfer a file named TEST.DOC from a double-sided diskette in the top drive to a single-sided diskette in the bottom drive, you would use the following procedure:

```
PIP J:=A:TEST.DOC
```

If the same file were to be copied from a single-sided diskette in the bottom drive to a double-sided diskette in the top drive, the following procedure would be used:

```
PIP A:=J:TEST.DOC
```

C: BIOS DOCUMENTATION

OTHER PERTINENT DATA

It is important for the user to understand that any information necessary for the creation of user programs is available in the BIOS. To obtain a listing of the BIOS, simply refer to the CP/M source disk and run a listing of the Assembly language file. The actual offsets and addresses vary with the different types of Eagles. Thus we have not included specific instructions for locating this information. However, the basic structure remains the same.

The first section of the print-out will consist of equates, the jumps, followed by the actual start of the BIOS including the data storage. The tables appear next, followed by the codes. Near the end of the listing are the tables which describe the characteristics of the disk used.

PROGRAMMABLE OR USER DEFINED KEYS

These are the two keys in the numeric pad above the ENTER key which are labelled F1 and F2. If the user has sufficient background in systems programming, it is possible to write a program for the utilization of the function keys. The information to do so is found in the BIOS.

NOTE

The entire keyboard is "soft" and defined in keyboard tables in the BIOS.

SCREEN CONTROL CODES

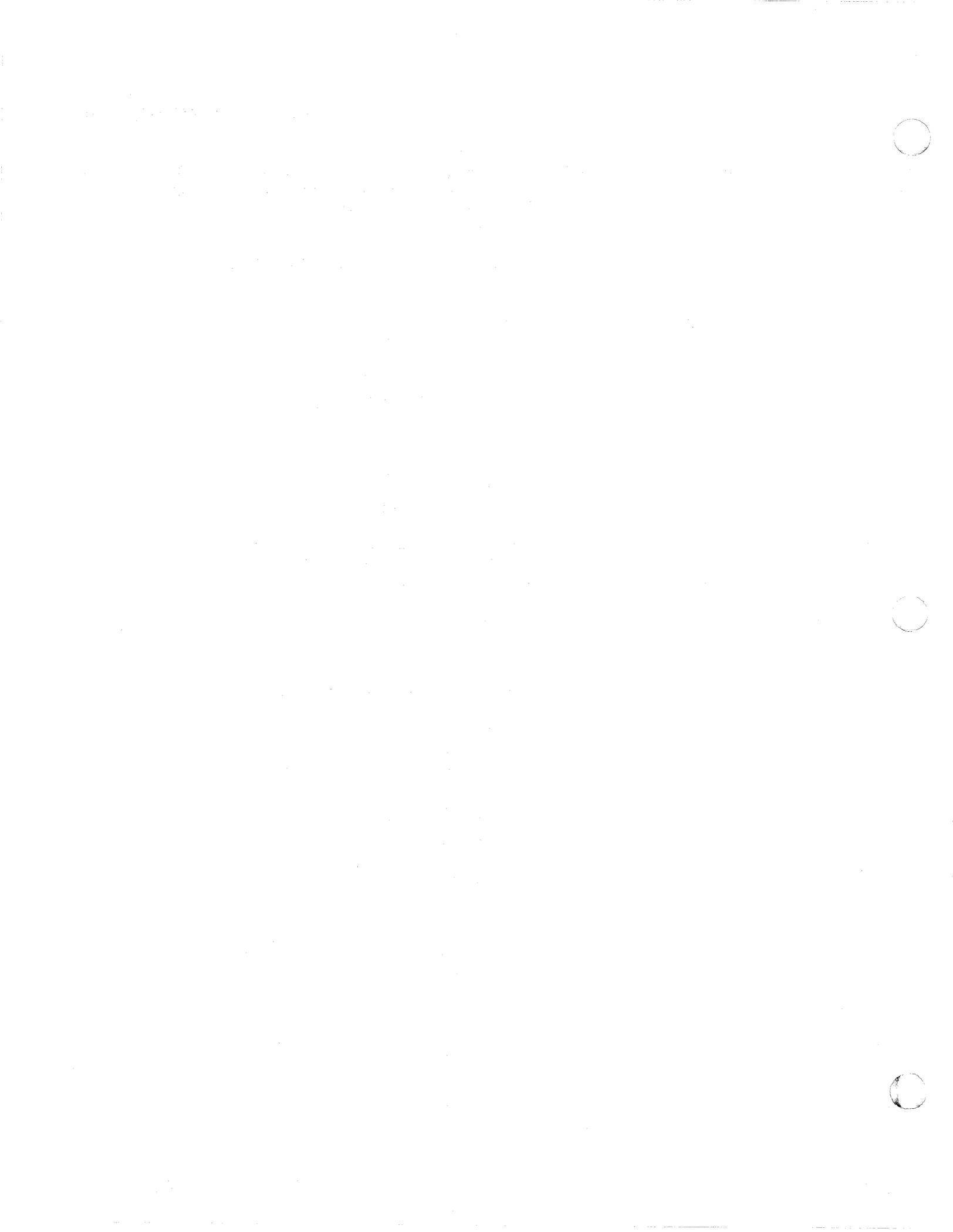
The video driver in the BIOS emulates a terminal which is similar to a SOROC 120. (Refer to Table 11 for the Control Codes and Table 12 for the Escape Sequences.)

TABLE 11: VIDEO CONTROL CODES

CHAR VALUES (HEX)	MEANING
07	Sound the beeper
08	Cursor left (backspace)
0A	Cursor down (line feed)
0B	Cursor up
0C	Cursor right
1A	Clear screen and home cursor
1E	Home the cursor
1B 29	Turn on reverse video
1B 28	Turn off reverse video
1B 54	Erase from cursor to end of line
1B 59	Erase from cursor to end of screen
1B 3D Row+20 Col+20	Cursor positioning

TABLE 12: ESCAPE SEQUENCES

SEQUENCE	FUNCTION
ESC + ")"	Reverse Video On
ESC + "("	Reverse Video Off
ESC + "T"	Clear to End of Line
ESC + "Y"	Clear to End of Screen
ESC + "="	Cursor Positioning Row, Column order Offset of 20



APPENDIX D

EPROM ERROR MESSAGES

ERROR MESSAGE	PROBABLE CAUSE	REMEDY
Floppy disk drive not ready	Empty disk drive; disk drive door open; defective disk drive.	<ol style="list-style-type: none">1. Insert diskette in disk drive.2. Insure that disk drive is locked.3. Reinsert diskette into drive.
Floppy disk read error	Bad diskette; improper seating of diskette; bad disk drive or controller.	<ol style="list-style-type: none">1. Reinsert diskette into drive.2. Retry with other diskettes.3. Contact dealer.
Winchester controller 0 not responding - controller 1 responding	Controller 1 has responded properly to a select signal, but controller 0 has not. File 10 Controller Select switch is in wrong position.	<ol style="list-style-type: none">1. Check that Controller Select switch is in proper position.
Winchester controller 0 diagnostic error	Controller 0 has failed the internal diagnostics; possible bad controller.	<ol style="list-style-type: none">1. Retry operation.2. If situation persists, contact dealer.
Winchester controller tested OK. Please standby for drive powerup.	Controller 0 has passed the diagnostics but reports that drive 0 is not ready.	<ol style="list-style-type: none">1. Retry operation.2. If situation persists, contact dealer.

(CONT'D)

APPENDIX D

EPROM ERROR MESSAGES (CONT'D)

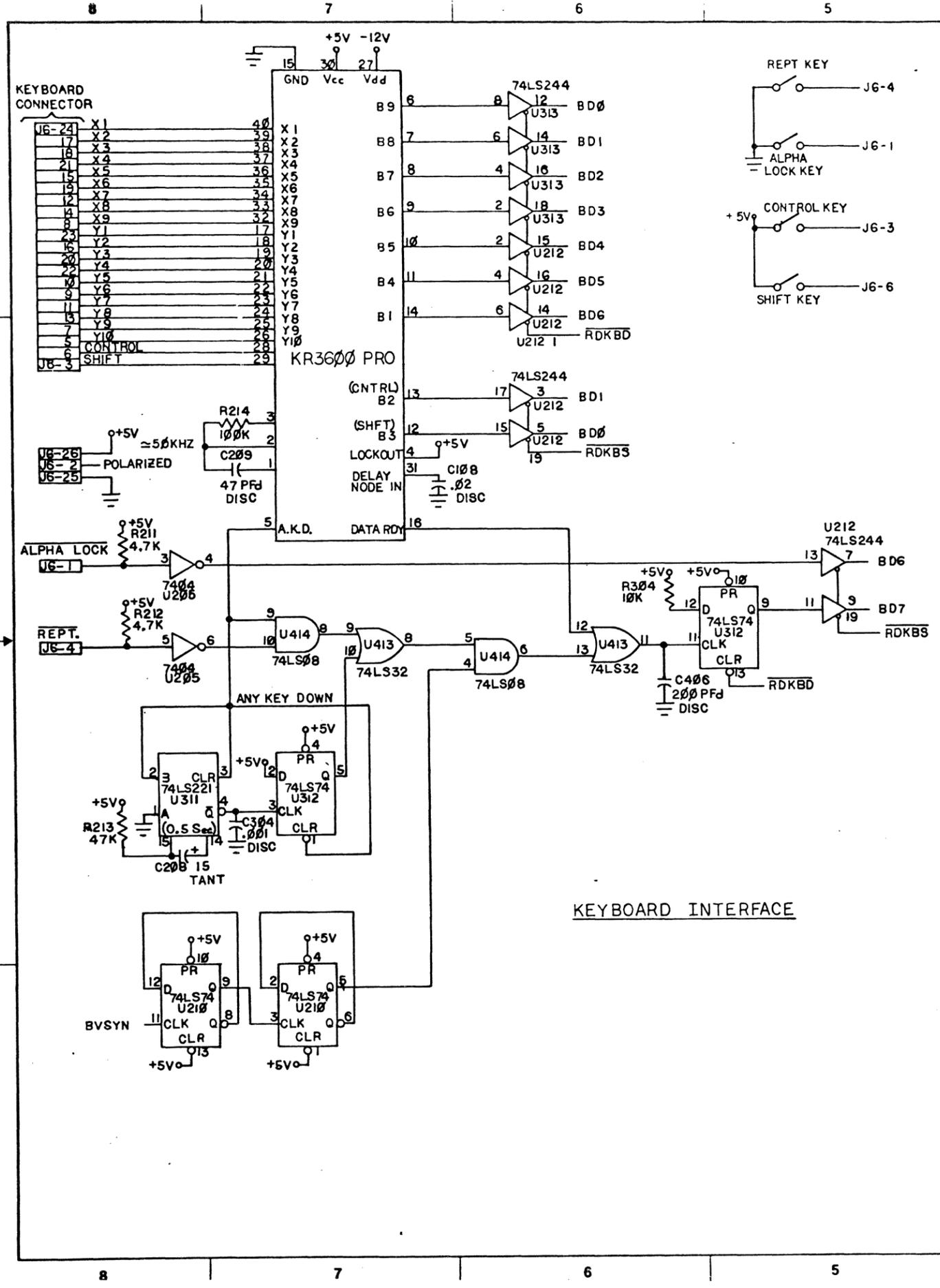
ERROR MESSAGE	PROBABLE CAUSE	REMEDY
Winchester disk drive not ready	Drive 0 has not reported as being ready after a one minute wait; possible bad hard disk drive.	<ol style="list-style-type: none">1. Retry operation.2. If situation persists, contact dealer.
Winchester disk read error	Drive 0 data read error. Possible bad data or disk drive.	<ol style="list-style-type: none">1. Retry operation.2. Perform diagnostics or contact dealer.
Winchester disk track zero cannot be read.	Disk type, sizing, and alternate track information cannot be read. Possible bad data or disk drive.	<ol style="list-style-type: none">1. Retry operation.2. Perform diagnostics or contact dealer.
Winchester system software not acceptable.	The system tracks of the hard disk do not contain valid data. Possible bad data or disk drive.	<ol style="list-style-type: none">1. Retry operation.2. Perform diagnostics or contact dealer.

E: SCHEMATICS

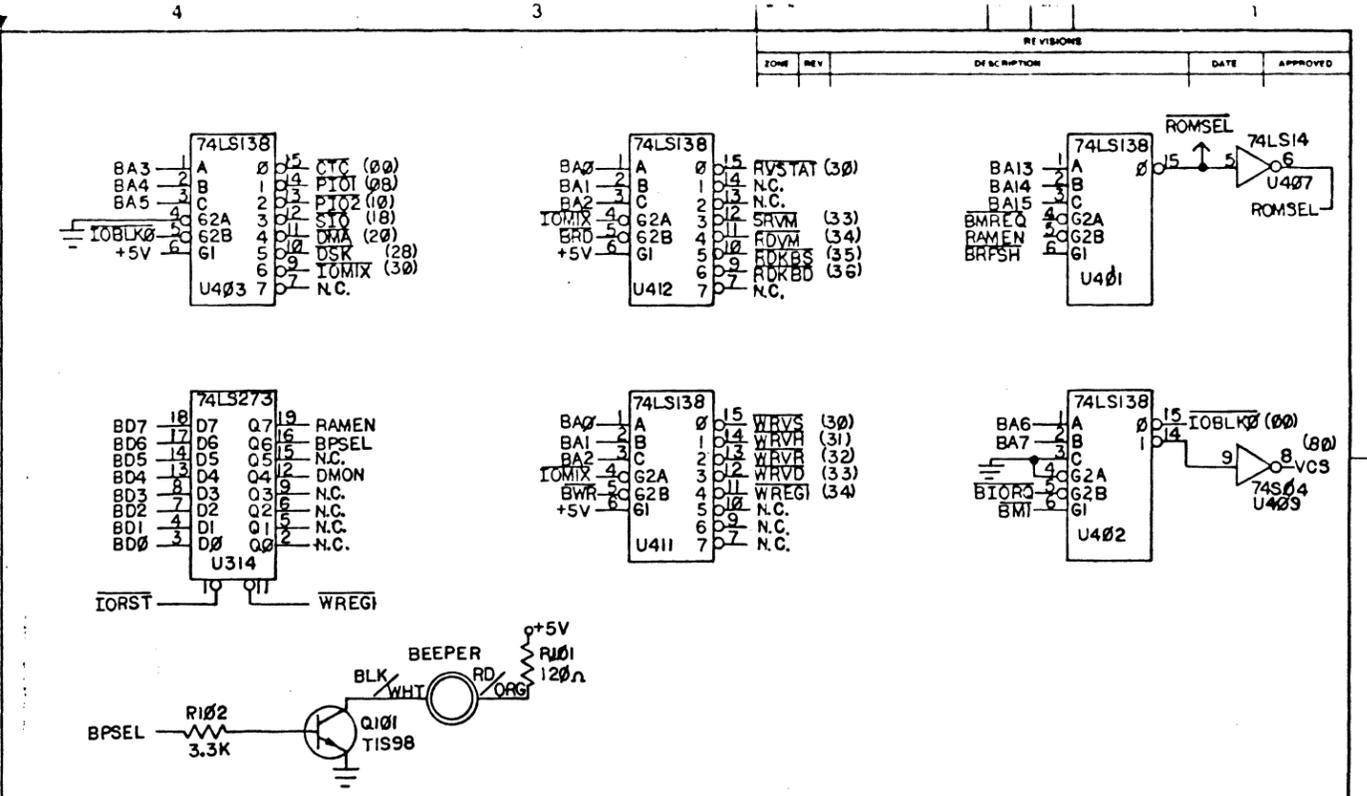
This section consists of the following schematics:

DRAWING #	DESCRIPTION	PAGE
20-13-021	Eagle II Main Board	1-4



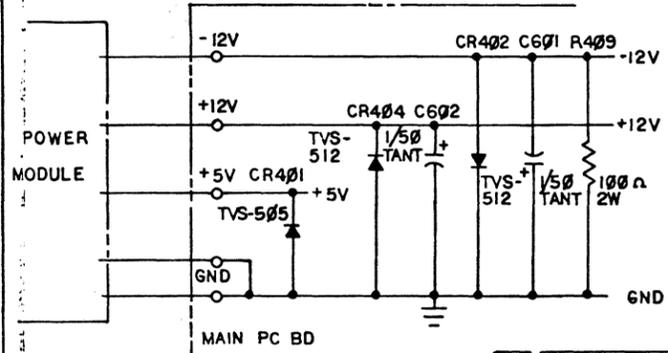


KEYBOARD INTERFACE



EAGLE II BUSINESS PC POWERS

NOTES
 1 USE PRINTED CIRCUIT BD. NO. 20 93 056C
 2 UNLESS OTHERWISE SPECIFIED:
 ALL CAPACITANCE IS IN MICROFARADS



(ALL OTHER 1/50 TANT CAPS ARE BETWEEN +5V AND GND)

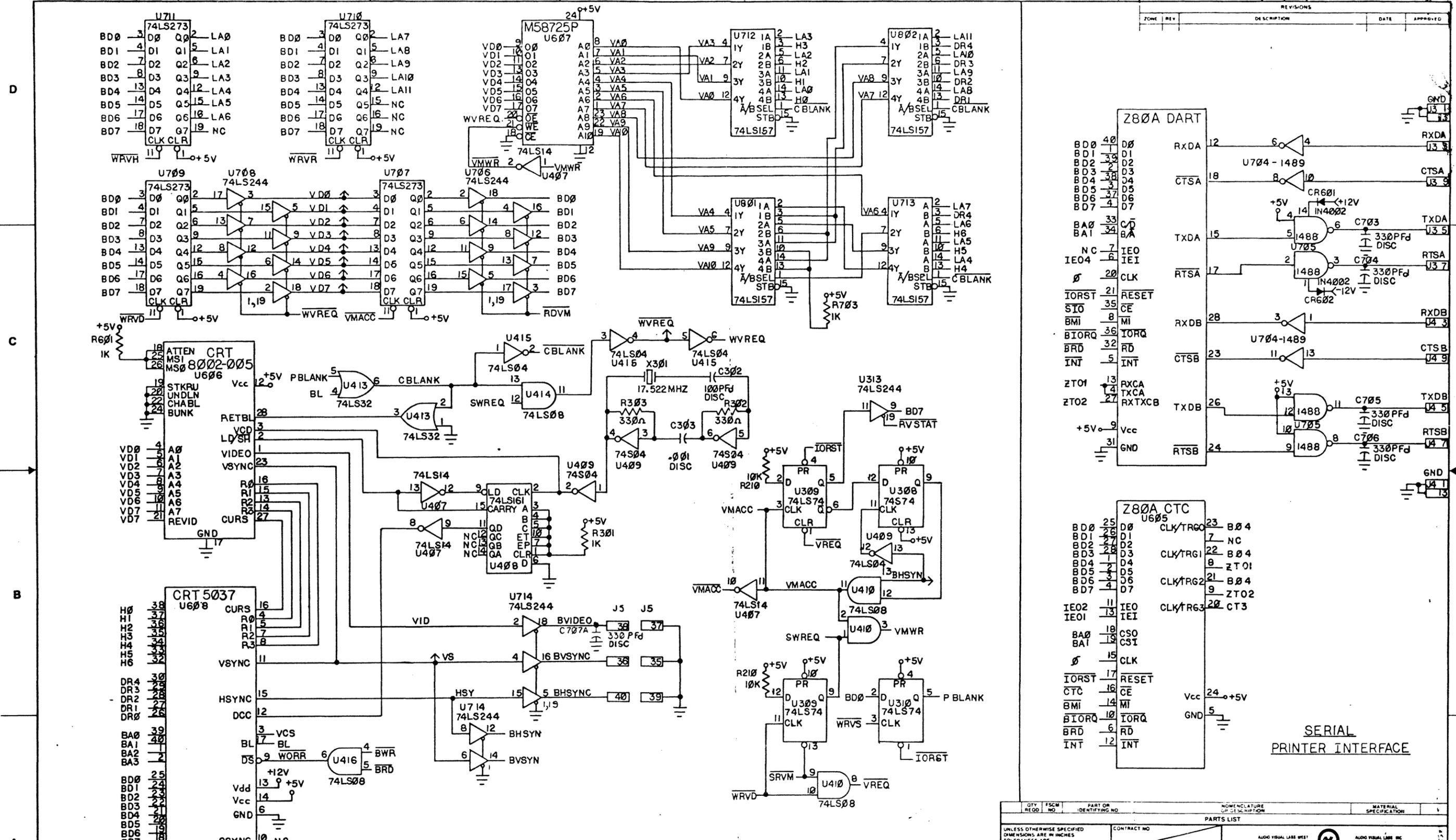
POWER AND GROUND PINOUTS										
	GND+5V		+12V		GND+5V		GND+5V		GND+5V	
1488	7				280A CPU	29	11	74132	7	14
1489	7				280A DART	31	9	74S74	7	14
2732	12	24			280A PIO	11	26	74LS00	7	14
					280A DMA	30	11	74LS04	7	14
4164	16	8			280A CTC	5	24	74LS08	7	14
NE564	8	1						74LS14	7	14
KR3600	15	30	27	7400				74LS32	7	14
M58725P	12	24			7404	7	14	74LS74	7	14
CRT8002	17	12			7474	7	14	74LS93	10	5
CRT5037	6	14	13		7475	5	12	74LS130	8	16
								74LS139	8	16
								74LS153	8	16
								74LS157	8	16
								74LS161	8	16
								74LS163	8	16
								74LS175	9	16
								74LS244	10	20
								74LS273	10	20
								74LS368	8	16

QTY REQD	FSCM NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XX.X .XXX °				
MATERIAL		CONTRACT NO		DATE
FINISH		APPROVALS		DATE
NEXT ASSY		CHECKED		DATE
USED ON		ISSUED		DATE
APPLICATION		DO NOT SCALE DRAWING		DATE

EAGLE TWO MAIN BD BUSINESS

SCALE N.A. SHEET 1 OF 4

REV. NO		REV
ZONE	REV	DESCRIPTION
		DATE
		APPROVED



VIDEO

SERIAL PRINTER INTERFACE

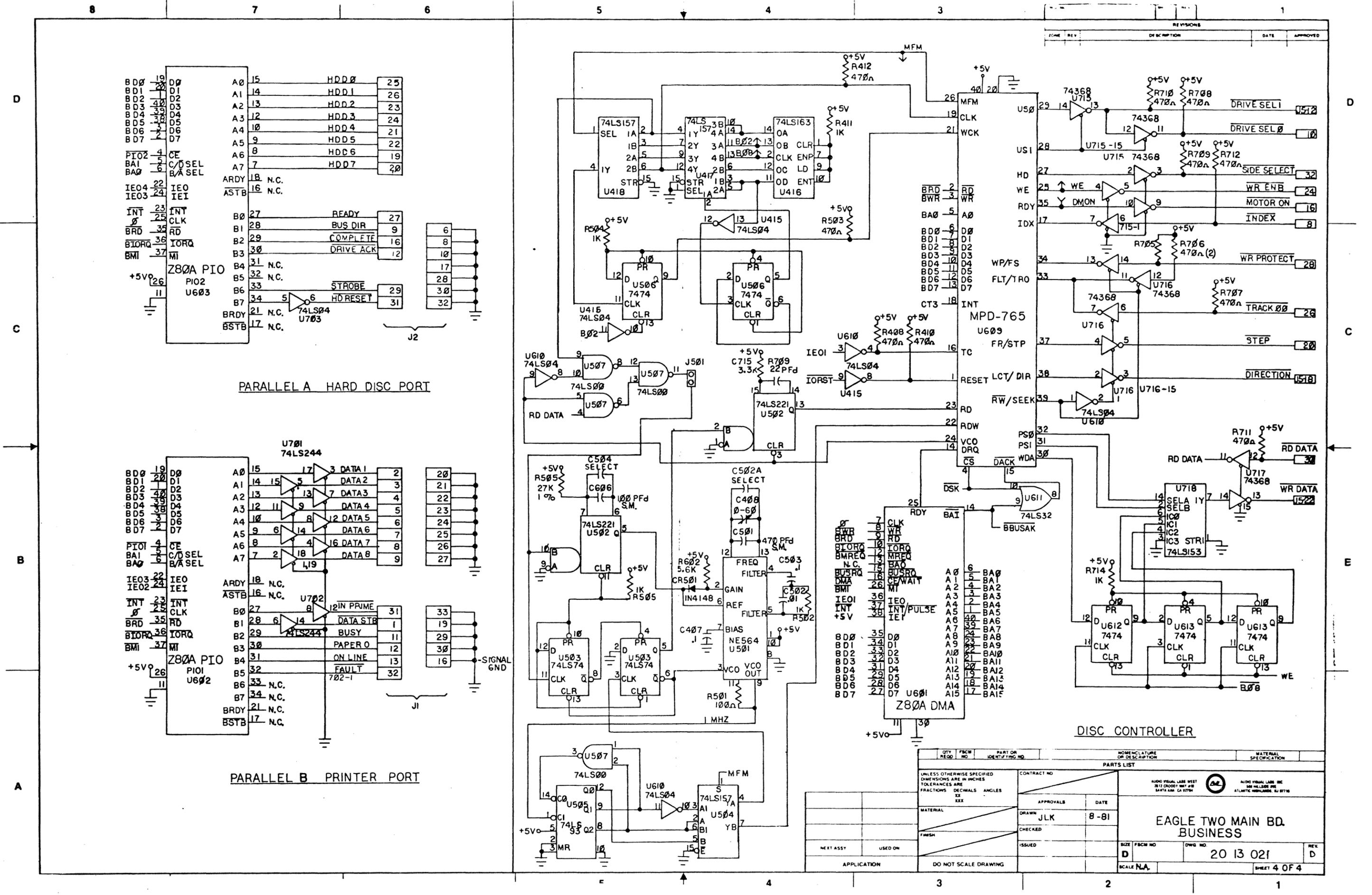
D

C

B

A

QTY	FSCM	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XXX				
APPROVALS		DATE		
DRAWN		8-81		
CHECKED		ISSUED		
NEXT ASSY		USED ON		APPLICATION
DO NOT SCALE DRAWING		SCALE NA		DRWG NO 20 13 021
EAGLE TWO MAIN BD BUSINESS		REV D		SHEET 3 OF 4



PARALLEL A HARD DISC PORT

PARALLEL B PRINTER PORT

DISC CONTROLLER

QTY REQD	FRM NO	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XXX				
APPROVALS		DATE		
DRAWN		JLK 8-81		
CHECKED				
ISSUED				
NEXT ASSY		USED ON		
APPLICATION		DO NOT SCALE DRAWING		
SCALE		N.A.		
SIZE		FRM NO 20 13 021		
DWG NO		REV D		
SHEET		4 OF 4		

EAGLE TWO MAIN BD. BUSINESS

INDEX

A

ASCII Code 37
Assembly Language File 132

B

Baud Rate 18
Beeper 121, 133
Boot EPROM 34, 43
Bootstrap Program 34
Brightness Control 75
Bus Control Lines 23
Busy Signal 19

C

Control Characters 19
CPU 117
CRT 8002 & 5037 Video Generator 34
CRT Adjustment 74
CRT Module 1, 2, 40, 41, 55, 72, 73
CTC 129
Cursor 133

D

Diagnostics, T Test 43
Digital Voltmeter 75
Disk Diagnostics 45
Disk Drive Module 1, 2, 53, 64
Diskettes 53
DMA Direct Memory Access 23, 44
Drive Configuration 62
Drive Sel 1 31
Drive Sel 0 31

E

Effective Period of Warranty 6
EPROM Error Messages 135
EPROM, Boot 34, 117

F

Fan Module 1, 55, 70
Fault Isolation 50
Flag Registers 23
Floppy Disk Drives 53
Floppy Disk Controller, MPD 765 30, 32
Focus Control 77

INDEX (CONT'D)

H	
Handshake Signals	26
Hard Disk Test and Initialization Disk	45, 46, 90, 91
Hard Disk Test Menu	47
Hard Disk Power Supply	68
Hard Disk Utility Menu	46
Hardware Warranty Policy	6
HELLO	83, 89
Horizontal Delay Control	76
Horizontal Width Coil	76
I	
Instruction Set, Z80A	23
Interface Signals	31
Interrupt Control Word	125
Interrupt Disable	126
Interrupt Vector	125
J	
J1	49
J2	49
K	
Keyboard Module	1, 2, 54, 69
Keyboard Encoder PRO 3600	30
L	
LED	53
M	
Main Board Module	1, 2, 52, 54, 57
Main Menu	83, 86
Mark Control Word	126
Menu Restore and System Regeneration Disk	86, 88
Mode Control Word	125
Modem	20, 26
Motorola Monitor	2, 35
MPD 765 Floppy Disk Controller	30, 32, 35
N	
NEC	130
Nonprecision Printer	
O	
Odd Parity	26
Operating System, CP/M	1, 84, 88

INDEX (CONT'D)

P	
Parameters, Setting	18
PIO	26
PIO 1	26
PIO 2	26
PIP	83, 86, 131
Power Supply Module	1, 2, 37, 50, 51, 59
PRO 3600 Keyboard Encoder	30, 33
PROM	38
Proof of Warranty	6
Q	
Quit	40
R	
RAM	2, 44, 117
Raster	55, 75, 76
RD Data	31
Read Registers	127, 128, 129
Reverse Video	34, 133
S	
SASI Interface Module	1, 3, 38, 49
Scan Rate	34
Screen Control Codes	133
Serial Printer	26
Setside	89
Shugart Drives	62
Side Select	31
Single File Transfer	80, 82
Software Master Disk	90, 91, 92
Software Warranty Policy	4
SRA Number	9
Step	31
SYSGEN	88
System Control Lines	23
T	
T Test Diagnostics	16, 43
Test Menu	47
TRANS	80
Transfer Software Routine	80
U	
Utilities Menu	46

INDEX (CONT'D)

V

Vertical Hold Control	76
Vertical Linearity Control	77
Vertical Size Control	77
Video Generator, CRT 8002 & 5037	34
Voltages, System	2, 37, 52

W

Warranty Policy	6
Warranty Limits	7
Warranty Credits	7
Warranty Statement	7
Winchester Controller Module	1, 3, 35, 53, 66
Winchester Disk Drive	1, 2, 12, 35, 54
WR Data	31
WR Enable	31
WR Protect	31
Write Registers	126, 127

X

XEBEC Controller	3, 38
------------------	-------

Z

Z80A Processor	2, 23, 29
Zilog	119